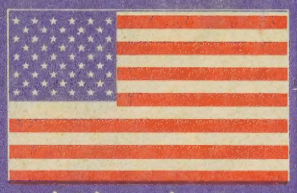

God Bless the U.S.A.

The RADIO WORKS

tm

Where Ham Radio is a Contact Sport!

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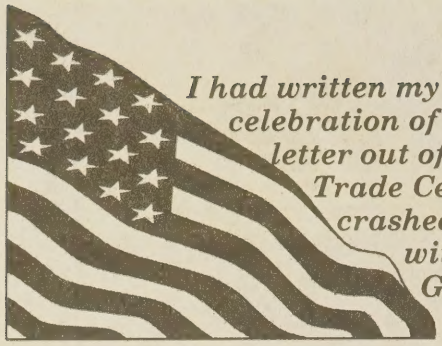
Catalog 2002 $3



I had written my original introduction before September, 11th. It was a celebration of a terrific year, 2001. However, I'm rewriting this part of my letter out of respect for all those who died or were injured at the World Trade Center, the Pentagon, and for those aboard the plane that crashed in Pennsylvania. It is certainly a time when I can say without hesitation that "I'm proud to be an American," as Lee Greenwood's song proclaims. I'm proud of all those who sacrificed so much: the Police, Fire Fighters, and Emergency Medical Technicians who abandoned fear and possibly catastrophic consequences to come to the aid of others. I'm proud of our military. I'm proud of everyone who has come together, united in a single righteous purpose to rid the world of those who dedicate themselves to delivering terror to others while contributing nothing to the good of society. I'm proud to see all the flags flying on American homes and on our cars and trucks. And, I'm proud to see an America that's kinder and gentler to each other. It is my prayer that God will guard our young men and women who are in harm's ways. It was my wish that no American pay with his or her life, but that has already happened. Yes, I'm proud to be an American and I wave the flag of our nation with enthusiasm for what we can be when we come together, united in a cause. "And, I'll gladly stand up, next to you and defend her still today. 'Cause there ain't no doubt, I love this land. God bless the U.S.A."*

In the past few months a lot has happened at the RADIO WORKS. We are working on some terrific new products. You'll see them on our web site and in our QST and CQ ads when they become available. Perhaps I could drop a little hint on what's in the works. There is a new and highly effective vertical antenna that can be put up and down in just a minute or two. It will be great from those who are space, deed, or CC&R restricted. Introduced in this catalog is a smaller and more easily hidden version of our CAROLINA WINDOM. It's perfect for anyone running under two hundred watts. It will be followed by an SWL version tuned to the shortwave bands. Just to keep up with requests, there are a couple of other special purpose antennas that I hope to introduce at Dayton 2002. Combine the antennas with some new, smaller baluns and Line Isolators™ and a couple of very high power baluns, and you can see that there is a lot going on here.

There is another first that will have taken place by the time you see this catalog. You will be able to find our most popular products in the Ten-Tec showroom. Their showroom is at their new retail store located at their factory location in Tennessee. As soon as we can increase production sufficiently, you might see our goodies at other dealers, too. Keep an eye on our web site and our magazine ads for the latest news.

I'm proud to announce that we are now offering Heil audio products. It's a perfect marriage of the best performing antennas and the best audio gear. We all know that the RADIO WORKS builds the best performing practical antenna systems. Once you have that big signal on the air that gives you the respect you deserve, the next step is producing great sounding audio with lots of punch. We already give you the big signal, now we bring you the audio systems that can take advantage of that big signal you'll have.

That is just the start. There are all kinds of new products in this catalog. Check it out, we have everything you need for your next antenna project, and you won't find better prices for quality parts anywhere.

As always, I want to thank each of you who have been loyal customers, some for as long as 16 years. Your support, feedback, suggestions, patience, and ham-spirit have helped us serve you better. It's our goal to provide even better service in the coming year.

Well, it's time to sign off. Thanks for making this our best year yet at The RADIO WORKS.

Stay tuned,
Jim, W4THU

*God Bless the U.S.A., words and music by Lee Greenwood. Copyright 1984, Music Corporation of America

You've got to see our web site!

WEB Site

Join the fun at - http://www.radioworks.com

New! Full Catalog Online

Now you can download the latest issue of our General Catalog and any forthcoming special interest catalogs in Acrobat PDF format. Also, available will be copies of our product manuals and excerpts from Jim's books.

Sales - Monthly, last minute and clearance sales are featured.

Jim's Notebook - All sorts of useful information about antennas, plus many articles from the "Reference Catalog" and Jim's "Most Asked Questions" books are available here.

Links to other sites - Thousands of active links are available covering every facet of amateur radio. I've even included some of my favorite sites which have nothing to do with ham radio but are fun or useful.

Jim Hamshack - It's a virtual tour of Jim's ever changing hamshack, his latest nostalgia and Classic Rigs collection plus the new station he's working on. I wonder what he'll do this time? You don't suppose that he'll finally go digital, do you?

There's lots more - It can take a couple of hours to see everything. There are more than 200 pages, but navigation is easy with lots of hypertext links.

Ralph, K1KOB - Artist

Just the other day, Ralph, K1KOB, our master antenna builder was in an exceptionally good mood. Upon inquiring, he told me that some of his most recent artwork is hanging at the Smithsonian American Heritage Museum. Incredible, I responded, confused. "Yes, he added, now I've got art hanging in the "Air and Space" museum in Hampton, Virginia, and I'm involved in a hot project involving Polynesian music being broadcasted from a remote Pacific island." Wow! I was impressed. Works of art and music. What surprises will Ralph reveal next? Well, there was more as he followed with news that he also had a masterpiece at the World Bank building in New York City.

I had no idea of what to make of all of this, after all, I'd never seen any of Ralph's art before. In fact, he never talked about it. So, I asked him how long he'd been into his this sort of thing. "Oh, at least 10 years," was the response. Still taken aback to all this, I had to ask what art form he was he using. "Abstract Sculpture. I especially like doves in flight." Well, I just had to see some of this art that was hanging in such famous places. "Not a problem, he responds, you see them every day. They're antennas that I've built at the RADIO WORKS.

I have to admit that I was taken in by this ruse, but after thinking about it, I decided that Ralph was right. The antennas he builds for us are so well done that they are indeed works of art. In fact, if you let your imagination run away a bit, you can see an abstract dove in flight, too.

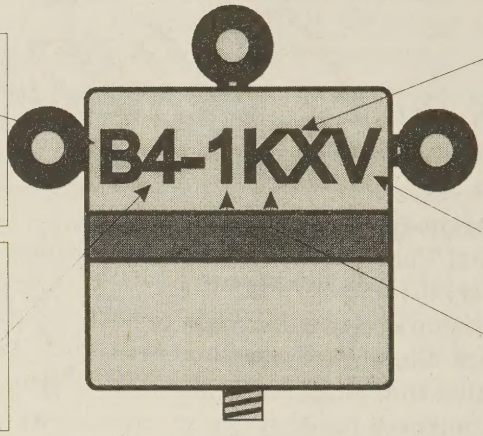
BALUNS *Designators & Descriptions*

Case Type

B- Standard balun Case
(Eye-bolts + SO-239 Connector)
Y- Yagi Applications, wire output

RATIO

1:1 50 Ohms in : 50 Ohms out
4:1 50 Ohms in : 200 Ohms out
6:1 50 Ohms in : 300 Ohms out



Designator for "Twin Core, X-Coupled or Cross-coupled" designs.

The "***V***" designator is for baluns designed for VHF operation

Power Rating

500 = 500 Watts
1.5K = 1500 Watts
2K = 2000 Watts
4K = 4000 Watts, etc.

Power is rated at 3.5 MHz unless otherwise specified. At 28 MHz power may have to be derated if the load SWR exceeds 2:1. In all cases, power must be derated if the load SWR exceeds 3:1.

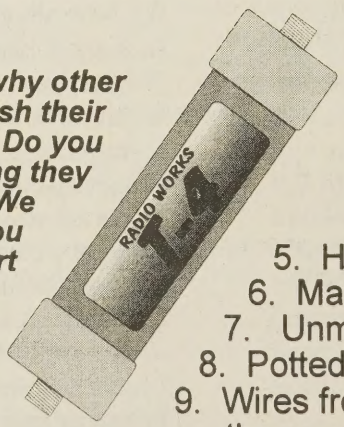
Power rating is for a typical SSB or CW duty cycles only.

As a matter of company policy, we do not endorse, nor support the use of amplifiers which exceed the legal power limit. However, we feel we must build antenna components that will withstand accidental misuse (i.e. tuning up on the wrong band). This is the only reason you will see baluns and Line Isolators with power ratings above the 1500 watt power limit.

BALUNS & LINE ISOLATORS

WHY?

Have you ever wondered why other manufacturers won't publish their product's specifications? Do you suppose there is something they don't want you to know? We publish the numbers so you can choose the correct part for your application. You can count on the RADIO WORKS for the best baluns, antenna systems, and matching transformers.



1. True Current-type baluns
2. Heavy Duty Construction
3. Stainless-steel Eyebolts
4. Eyebolts are not internally connected
   This reduces receiver noise from the connection of dissimilar metals.
5. High Voltage, high temperature wire
6. Massive ferrite Cores
7. Unmatched specifications
8. Potted for weatherproofing
9. Wires from internal windings are brought outside the case for direct connection to your antenna.
10. There is no chance of poor connections.

The RADIO WORKS
is
Baluns

The RADIO WORKS introduced a full line of precision, 'Current-type' baluns several years ago. They were instantly popular because 'Current-type,' baluns avoid the bad habits that conventional 'Voltage-type' baluns exhibit. 'Voltage-type' baluns try to produce equal and opposite voltages at the balun's balanced port regardless of the load impedance. Since low impedance antennas are current fed, a balun that produces equal and opposite currents at its output over a wide range of load impedances is desirable. There is little to be gained by forcing the voltages of the two antenna halves, whether the antenna is balanced or not, to be equal and opposite relative to the cold side of the balun input. The antenna field is proportional to the currents in the elements, not the voltages at the feed point.

Current-type baluns are not a new idea.

They have been used in TV receivers for many, many years. TV tuners require a very wide bandwidth balun that will work with a severely mismatched antenna, like a TV's so-called 'rabbit ears' antenna. The Current-type balun was the best choice for that application.

Unfortunately, when baluns were first popularized for use with wire antennas, a voltage-type design was chosen. Other balun makers just followed along. It was years before the first true, Current-type baluns appeared on the market.

Of course, times change and today you can find entire books devoted to Current-type baluns. Only The Radio Works was the first to offer you a full line of Current-type baluns for every application.

The RADIO WORKS
Box 6159 Portsmouth, VA 23703 (757) 484-0140

Misconceptions

1. Baluns will not improve SWR (the exception is when a balun used as part of a matching network, i.e 4:1 baluns used in loops)
2. They are not lightning arresters, the winding inductance in most baluns is too low.
3. Also, built-in spark gaps don't work. The radio equipment is long gone before the 'gap' arcs over.
4. Baluns do not allow multiband operation of single band, coax fed, antennas, nor do they make antennas more broad-banded.

These are all generalizations and, of course, there may be specific exceptions to any of them.

A balun really has only two jobs

1. Isolate transmission line
2. Provide balanced output current

Proper Balun Design

A properly engineered balun will include these design points:

1. High winding inductance (reactance)
2. Low stray capacitance
3. Very short internal transmission lines- << 1/4 wave, the shorter the better
4 High power components- High voltage wire & insulation to withstand high power or a mismatch.
5. Large wire gauge reduces I^2R losses.
6. Large cores - prevents saturation and provide the necessary high inductive reactance values on the low bands.
7. Mechanical considerations: Weather-proofing, rustproof hardware and a strong case to withstand high physical loads.

Baluns

To insure the utmost in reliability, wires from the internal windings of the *B1, B4, Y1,* and *RemoteBaluns* are brought directly outside the case for connection to the antenna. This eliminates any chance of an unreliable connection. The tradeoff is that the holes where these wires exit the balun's case must be sealed. CoaxSeal® is included with each balun and Line Isolator™ for this purpose and to seal the coaxial connector.

The transmission lines (the balun's windings) are carefully designed for optimum impedance, and the all-important wire used to make these internal transmission line(s) or other windings are insulated with a material similar to Teflon®. Top of the line models may use silver-plated wire and Teflon® insulation for maximum power handling and minimum power loss.

All 1:1 and some 4:1 models are Current-type designs. Current-type baluns are extraordinarily saturation resistant and provide superior reactance characteristics. Signal distortion and RFI due to core saturation is practically eliminated. Current-type baluns are very forgiving when feeding antennas that do not provide an ideal load.

Retrofit Line Isolators

A very useful application for Line Isolators is to install them in series with a beam antenna's current feed system. The proper location is between the antenna's balun or matching device/system and the feedline. Doing this will not affect antenna matching unless the feedline is acting as part of the antenna. This is, of course, not a desirable situation and the installation of the Line Isolator will point out that a major problem exists with the antenna. In normal installations, where there is little interaction between the antenna and the feedline, using a Line Isolator in series with the antenna's feed system can substantially improve the antenna's front-to-back and front-to-side ratios. It does this by providing the antenna with balanced current at the feedpoint and by very effectively preventing the feedline from acting as part of the antenna. It is a seldom appreciated fact that ineffectively decoupled feedlines can act as efficient vertical antennas that can degrade an otherwise excellent radiation pattern. The addition of a Line Isolator or a proper balun can significantly reduce feedline radiation and dramatically decrease RFI and TVI. Beam antennas, especially, benefit from improved balanced drive and superior feedline isolation, but even simple dipoles benefit from properly selected and installed baluns and Line Isolators. Receiver noise also may be reduced by eliminating signal pick-up by the feedline.

Remote Balun

Now, you can have the convenience of coaxial cable combined with the flexibility of open wire.

The *RemoteBalun*™ is a special, saturation resistant, Current-type balun capable of handling the legal power limit with loads of moderately high impedance.

Unlike other baluns, the *RemoteBalun* is designed specifically for antennas fed with open-wire, ladder line or twin-lead. The balun is located outside where it belongs. A short length of very low loss coaxial cable connects your transmatch (tuner) to the *RemoteBalun*. This eliminates the complication of routing balanced feeders into the radio room.

RFI Applications

Current-type baluns and Line Isolators are especially effective in reducing RF current on the outer surface of a coaxial cable's shield while having no effect on the signal carried within the cable. Current-type devices are singularly well suited to this application, because of several exceptional features that are not present in other balun designs. In the list of desirable characteristics is a very high load isolation over a very wide bandwidth, extremely low loss characteristics, and a wide, low SWR bandwidth.

1:1 Balun Specifications and Applications

Model	B1-200	B1-2K Plus	B1-5K Plus	Y1-5K Plus	B1-6K Plus	B1-1KV VHF
Type	Current	Current	Current	Current	Current	Current
Ratio	1:1	1:1	1:1	1:1	1:1	1:1
Bandwidth	80 - 10 m	80 - 6 m	160 - 6 m	160 - 6 m	160 - 6 m	15 - 2 m
Coefficient of Coupling	100%	100%	100%	100%	100%	100%
Power Loss in dB	Nil	Nil	Nil	Nil	Nil	Nil
Saturation resistant core?	Yes	Yes	Yes	Yes	Yes	Yes
Internal transmission line Z	50 Ohms	50 Ohms	50 Ohms	50 Ohms	50 Ohms	50 Ohms
Core type	HF Ferrite	HF/VHF Ferrite	HF/VHF Ferrite	HF/VHF Ferrite	HF/VHF Ferrite	VHF Ferrite
L-C compensation?	No	No	No	No	No	No
Power Rating @ 3.5 MHz*	200 W	1500 W	5 KW	5 KW	6 KW	500 W @ 6 m
Output Balance	Excellent	Excellent	Excellent	Excellent	Excellent	Good
Load variation tolerance	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent
Input connector	SO-239	SO-239	SO-239	SO-239	SO-239	SO-239
Output connector	Wire	Wire	Wire	Wire	Wire	Wire
Eye-bolts for wire attachment?	Yes	Yes	Yes	1 on top	Yes	Yes
Physical Size	2.3" x 4.8"	2.3" x 8"	2.3" x 8"	2.3" x 8"	2.3" x 12"	2.3" x 6"
Weight	6 oz.	14 oz.	17 oz.	17 oz.	24 oz.	8 oz.

* Power rating of HF baluns is based on a CW/SSB duty-cycle and an SWR of 3:1 or less at the output of the balun.

Baluns are not rated for AM, RTTY or other high duty-cycle modes.

Eye-bolts are stainless-steel and are not internally connected.
Specifications are subject to change without notice.

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4:1 Balun Specifications and Applications

Model	B4-100	B4-1.5K	B4-2K	B4-2KX	B4-1KXV VHF Balun	Remote Balun
Type	Voltage	Voltage	Voltage	Current	Current	Current
Ratio	4:1	4:1	4:1	4:1	4:1	4:1
Bandwidth	80 - 10 m	80 - 10 m	80 - 10 m	160 - 10 m	15 - 2 m	160 - 10 m
Coefficient of Coupling	99%	99%	99%	99+%	99+%	99+%
Power Loss in	< .7 dB	< .8 dB	< .7 dB	< .8 dB	< 0.1 dB	< .9 dB
Saturation resistant core?	Good	Excellent	Moderate	Excellent	Good	Excellent
Core type	Ferrite	Ferrite	Ferrite	Twin-core Ferrite	Ferrite	Twin-core Ferrite
L-C compensation?	No	Yes	Yes	Yes	No	Yes
Peak Power Rating @ 3.5 MHz*	100 W	1.5 kW	1.5 kW	1.5 kW	500 W @ 6 m	1.5 KW**
Output Balance	Good	Good	Good	Excellent	Good	Excellent
Load variation tolerance	Good	Good	Good	Excellent	Excellent	Excellent
Input connector	SO-239	SO-239	SO-239	SO-239	SO-239	SO-239
Output connector	Wire	Wire	Wire	Wire	Wire	Wire
Eye-bolts for wire attachment?	Yes	Yes	Yes	Yes	Y es	Yes
Physical Size	1.5" x 2.7"	2.3" x 8"	3.5" x 3.5"	3.5" x 3.5"	2.3" x 7"	3.5" x 3.5"
Weight	6 oz.	12 oz.	12 oz.	16 oz.	10 oz.	18 oz.

* Power rating is based on a CW/SSB duty-cycle and an SWR of 3:1 or less at the output of the balun.
** May require derating under some load conditions.

Baluns are not rated for AM, RTTY or other high duty-cycle modes.

Eye-bolts are stainless-steel and are not internally connected.
Specifications are subject to change without notice.

The RADIO WORKS Box 6159 Portsmouth, VA 23703 (757) 484-0140

Line Isolator Specs and Applications

Model	T-4 & T-4G Plus	T-4-500	T-5G	T-6 & T-6G VHF
Type	Current	Current	Current	Current
Ratio	1:1	1:1	1:1	1:1
Bandwidth	160 - 6 m	160 - 6 m	1.8 - 150 MHz	15 - 2 m
Coefficient of Coupling	100%	100%	100%	100%
Power Loss in dB	Nil	Nil	Nil	Nil
Saturation resistant core?	Yes	Yes	Yes	Yes
Internal transmission line Z	50 Ohms	50 Ohms	50 Ohms	50 Ohms
Winding Z @ 3.5 MHZ	> 33 K	> 35 K	> 75 K	
Winding Z @ 14 MHZ	> 80 K	> 75 K	> 50 K	>1.5 K @ 21 MHz
Winding Z @ 50 MHZ	> 4 K	> 20 K	> 1000 Ω	>1.6 K @ 150 MHz
Core type	HF Ferrite	HF Ferrite	Multiple HF & VHF Ferrite	VHF Ferrite
Power Rating @ 3.5 MHZ*	>1500 W 200 W @ 50 MHz	500 W 100 W @ 50 MHz	4 KW 1 KW @ 50 MHz	1 KW @ 28 MHz 500 W @ 50 MHz
Load variation tolerance	Excellent	Excellent	Excellent	Excellent
Input connector	SO-239	SO-239	SO-239	SO-239
Output connector	SO-239	SO-239	SO-239	SO-239
Eye-bolts for wire attachment?	No	No	No	No
Physical Size	2.3" x 8"	1.5" x 4.5"	2.3" x 8"	2.3" x 7"
Weight	16 oz.	5 oz.	8 oz.	8 oz.

* *Power rating is based on an SSB/CW duty-cycle and an SWR of 3:1 or less at the output of the Line Isolator.* Specifications are subject to change without notice.

Line Isolators are not rated for high power AM, RTTY other high duty-cycle modes.

Eye-bolts are stainless-steel and are not internally connected.
Specifications are subject to change without notice.

The RADIO WORKS Box 6159 Portsmouth, VA 23703 (757) 484-0140

Baluns Just Aren't What They Used To Be ... Thankfully!

It seems like everyone thinks they can build baluns, and they make all sorts of incredible claims to prove it. We don't make claims. We print specifications.

Most commercially produced baluns are Voltage-type baluns. The 'Current-type' balun is superior to simple 'Voltage-type' baluns in several ways. The most important differences are better output balance and higher feedline-to-antenna isolation. This means you enjoy improved antenna radiation patterns and fewer problems with TVI, RFI and RF feedback.

The RADIO WORKS' 'Current-type' baluns provide the ideal interface between unbalanced coax and balanced antennas. Of course, this is just what a balun is supposed to do.

We have learned a lot since we built the first C1-2K baluns in 1985. Those lessons have taught us how to make the incomparable RemoteBalun, the B1-5K, the B4-2KX, the T-4 and other Line Isolators[tm]. Current-type baluns are now recognized as the best design. It is good to have had a major part in popularizing this important innovation.

Important - Power Ratings

All RADIO WORKS' products power ratings are for standard duty-cycle SSB and CW transmissions. We do not rate any of our products for high duty-cycle modes. This includes AM, RTTY and high duty-cycle digital modes. Essentially, these modes require devices designed for commercial service. It's either that or low power levels. I have checked on prices for a commercial 2 kW balun s and the price was nearly $1500. This is certainly beyond the range of most of our budgets. I know that there are some amateur radio baluns that claim power ratings of very high values. However, they say nothing about a duty-cycle rating nor the load conditions under which they will survive their rated power. I am being up-front with our ratings.

Power ratings are an interesting subject. It has been only during that past five years that the interest in very high power operation has been more than a very isolated case. We have been building baluns and Line Isolators for 16 years and our power ratings were solid as a rock. Most operators were using SSB and CW and still do. Then came the resurgence of AM operation and the apparent disregard of power limits. For example, an AM transmitter generating 1500 watts of carrier produces 6 dB higher output when fully modulated. In other words, the 1500 watt transmitter delivers 6000 watts of modulated RF to the antenna components. That's for a fully plate modulated carrier. The legal limit is 375 watts of carrier, by the way. That results in 1500 watts of modulated output.

The operating style of AM and most RTTY operators, especially when contesting or when just being long-winded, run key-down for long periods of time. The same goes for the new digital modes, too. There is no cool-down time for antenna components, and, at high power, they can overheat when stressed beyond their ratings.

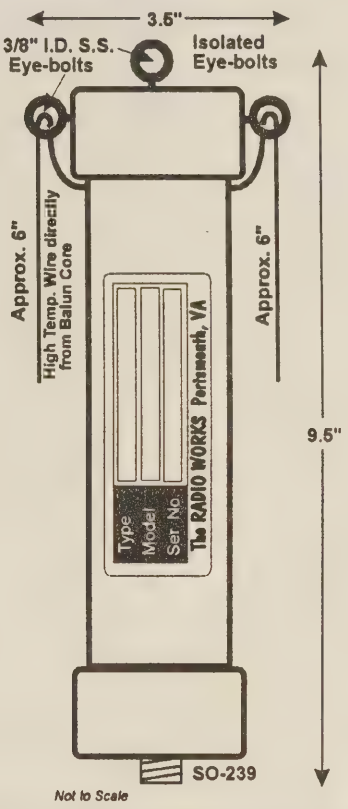
Another problem with the popularity of using older transmitters which run "class-C" output stages is the very high harmonic and spurious signal content of the output signal. Some antenna components, among them, high quality current baluns and Line Isolators, absorb much of the harmonic and spurious energy which can result in core saturation and excessive heating. You may say that this doesn't happen in other types of devices. The reason is that these devices just pass the harmonics and spurious signals along to the antenna. This isn't to say that current baluns and Line Isolators can be used as "low pass filters." Their functions are different, and they should be used together.

B1-2K Plus

	B1-2K Plus
Balun Type	Current
Ratio	1:1
Operating Bandwidth	80 - 6 m
Power Loss, dB	Nil
Saturation Resistant	Yes
Internal XMSN Line Z	50 Ohms
Core Type	HF/VHF Ferrite
SSB/CW Power Rating @ 3.5 MHz*	1.5 KW if SWR < 3:1
Output Balance	Excellent
Load Variation Tolerance	Excellent
Input connector	SO-239
Output Connector	Wire
Size	2.3" x 8"

***Important: SSB/CW duty-cycles only. Not rated for AM, RTTY or other high duty-cycle modes.**

Applications: Dipoles, trap dipoles, Inverted-V, Slopers, etc. Any application requiring a 50-ohm balun.



The best, low cost, Current-type Balun

List Price $29.95

Catalog price **$24.95**

Direct connection between the balun's windings and the antenna's elements means there is no chance of an intermittent connection. Eye-bolts are stainless-steel and the entire assembly is built for long life.

Uncompromising Performance

The B1-2K follows the same tradition of the uncompromising performance established by the incomparable C1 and B4 baluns. (The C1-2K balun is not in current production. It has been replaced with newer models.) The B1-2K is built into a conventional case with eye-bolts. It is here that the similarity with other products ends. The B1-2K is a full power balun. The cores are over twice the size of other manufacturer's baluns. Only the RADIO WORKS' design brings the wires from the balun's windings directly outside the case so you may solder them directly to your antenna wire.

Super Bonus

We are always looking for a better deal for you. I'm happy to say that we are now able to give you the ***B2-1K Plus*** which adds 6 meters to the excellent B1-2K current balun design. And, we do this for the regular B1-2K price.

B1-5K Plus

5 KW, 1:1, Current-Type Balun

Balun Type	Current
Ratio:	1:1
Operating Bandwidth	160 -6m
Power Loss, dB	Nil
Saturation Resistant	Yes
Internal XMSN Line Z	50 Ohms
Core Type	Ferrite
Power Rating @ 3.5 MHz	5 KW if SWR < 3:1
Output Balance	Excellent
Load Variation Tolerance	Excellent
Input connector	SO-239
Output Connector	Wire
Size	2.3" x 8"

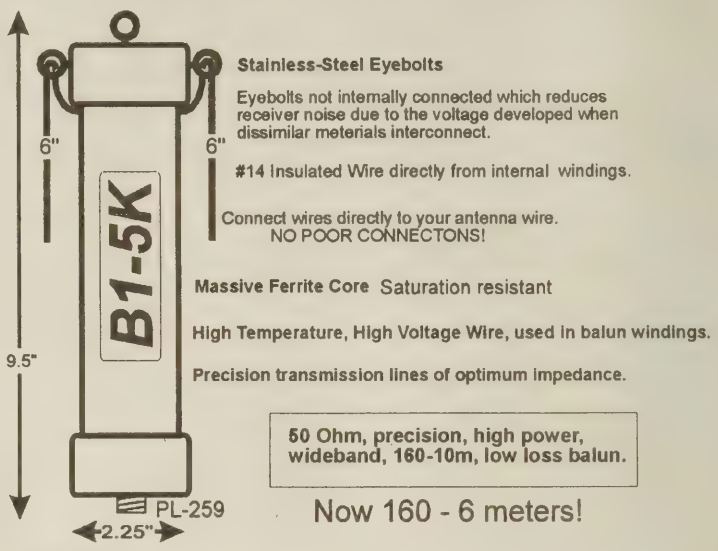

6"
6"
9.5"
B1-5K
PL-259
2.25"
Stainless-Steel Eyebolts
Eyebolts not internally connected which reduces receiver noise due to the voltage developed when dissimilar meterials interconnect.
#14 Insulated Wire directly from internal windings.
Connect wires directly to your antenna wire.
NO POOR CONNECTONS!
Massive Ferrite Core Saturation resistant
High Temperature, High Voltage Wire, used in balun windings.
Precision transmission lines of optimum impedance.
50 Ohm, precision, high power, wideband, 160-10m, low loss balun.
Now 160 - 6 meters!

Figure 1

Important: SSB/CW duty-cycles only. Not rated for AM, RTTY or other high duty-cycle modes.

Applications: Dipoles, trap dipoles, Inverted-V, Slopers, etc. Any application requiring a 50-ohm balun.

List Price $39.95

Catalog Price **$35.95**

A RADIO WORKS BONUS

We're giving you the ***B1-5K Plus*** at the regular B1-5K price. We're celebrating all the new products introduced in this catalog.

Just Another 'BIG' Balun?

We built the B1-5K balun as part of an antenna project for the Peace Corps in Zaire, Africa. They needed an antenna for a high power application. Several commercial antenna systems had failed in similar service, so they asked us to build a bulletproof system. We developed the B1-5K as the heart of that project.

The B1-5K's specifications are impeccable. It is as close to a laboratory quality unit as we can get with an economical balun made to handle high power. It builds on the success of the incredible C1-2K. In fact, it is really a superpower version of the C1-2K balun which has been superceded by the B1-5K. The B1-5K has a nearly flat reactance curve from 160 meters to 6 meters.

The Ultimate Balun? B1-5K Plus

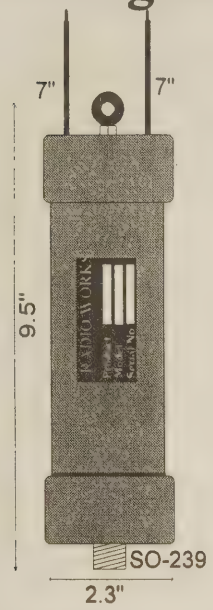
The B1-5K is the answer to requests for a precision balun covering 160 - 10 meters. The B1-5K Plus adds 6 meters. I do not know of another balun with this combination of precision, specifications, high power rating, and construction quality.

Both B1-5Ks are remarkably saturation resistant. This ends signal distortion and RFI problems that plague common 'Voltage-type' baluns.

The B1-5K and B1-5K Plus are Current-type baluns. They take abuse in stride. Even with power overload and load mismatch, the B1-5K survives. Current-baluns like the B1-5K provide better output balance and far better reactance characteristics than 'Voltage-baluns' that require a nearly perfect load.

Y1-5K Plus YAGI BALUN™

The Original, High performance, High Specification Yagi Balun



SPECIFICATIONS

Balun Type:	Current
Ratio:	1:1
Bandwidth:	160 - 6 m for Y1-5K
Coupling Coefficient:	100%
Power Loss in dB:	Nil
Internal transmission Line Z:	50 Ohms
Phase Delay @ 3.5 MHz:	1.4°
Core:	Ferrite
Power rating @ 3.5 MHz*	5 KW if SWR < 3:1, 1 KW on 6 meters
Output balance:	Excellent
Load variation tolerance:	Excellent
Size:	2.3" x 8"

**** Important: CW/SSB duty-cycle only. Not rated for AM, RTTY or other high duty-cycle modes.***

BY CUSTOMER REQUEST!

You asked for a precision, high performance YAGI BALUN™. The RADIO WORKS brings you what you want as only we can. The Y1-5K and Y1-5K Plus combine the best electrical characteristics of all of the baluns we have built over the years. A high power rating is an extra bonus of this design. So, now you have the high power ratings for the big safety margin you want plus electrical specifications that are unmatched. You get the maximum performance possible from your beam.

For beams fed directly with coax and those using coiled-coax choke baluns, consider using the T-4 Line Isolator as an alternative to the Y1-5K. The T-4 is an excellent choice for all directly fed beam antennas.

IMPROVED PERFORMANCE

If the manufacturer of your beam does not specify a particular balun for your beam, use the Y1-5K, Y1-5K Plus, a T-4 or T-4 Plus (see the note in the previous column). Unless a specific balun is part of the antenna's matching system, and this is not usually the case, substituting the Y1-5K will not adversely affect antenna matching.

Adding the Y1-5K or T-4 Line Isolator can improve the front-to-side and front-to-back ratios in many beams by maximally isolating the feed line from the beam. The feed line can act as a long vertical antenna coupled to your beam if isolation is insufficient. Another thing you may notice is a reduction in receiver noise level.

INSTALLATION

Two output wires emerge from the top of the case on either side of a stainless-steel eye-bolt. Connect these two wires directly to the antenna's feed point. The output wires are exactly 9" long (from internal winding to each end). *With some beams you may need to consider the lead length.*

Mounting the 'Yagi Balun' is not critical. It may be supported by its eye-bolt or, as an alternative, taped or strapped directly to the beam's boom. The SO-239 input connector will accommodate a standard PL-259.

Y1-5K Plus $37.95

Now receive the "Plus" version at the regular Y1-5K price.

A RADIO WORKS Bonus

The RADIO WORKS
Box 6159 Portsmouth, VA 23703
(757) 484-0140

B1-6K

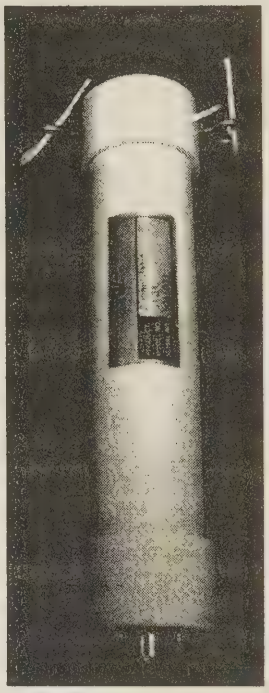
6 KW, 1:1, Current-Type Balun

Balun Type	Current
Ratio:	1:1
Operating Bandwidth	160 -10 m *
Power Loss, dB	Nil
Saturation Resistant	Yes
Internal XMSN Line Z	50 Ohms
Core Type	Ferrite
Power Rating @ 3.5 MHz	6 kW peak if SWR < 3:1
Output Balance	Excellent
Load Variation Tolerance	Excellent
Input connector	SO-239
Output Connector	Wire

*** Reduce power or duty-cycle on 10, 12, and 15 meters.**

Applications: Dipoles, trap dipoles, Inverted-V, Slopers, etc. Any application requiring a high-power 50-ohm balun.

The Monster Balun is back. ..... and it's better than ever.



List Price $129.95

Introductory Price

$69.95

Monster Balun?

Several years ago, we produced a high power balun for contesters and those who needed the extra safety factor high power ratings offer. Over the years there have been numerous requests to bring it back. I was reluctant because the B1-5K would handle the needs of most operators. Still, some wanted more for their AM, RTTY and high duty-cycle digital operations. While I still endorse only legal power limits, I realize that high duty cycle modes are getting more popular. The B1-6K is ready to meet that need. It won't replace a $1500 continuous duty unit designed for commercial service, high power AM operation, but it will handle a continuous 1500 watts output and peak power in excess of 6000 watts. No, that's not 1500 watts of carrier and 6000 watts of amplitude modulation peaks. But, if you are operating within legal power limits, this balun will do the job for you.

The Contest SSB, CW, AM, RTTY, or Digital Balun

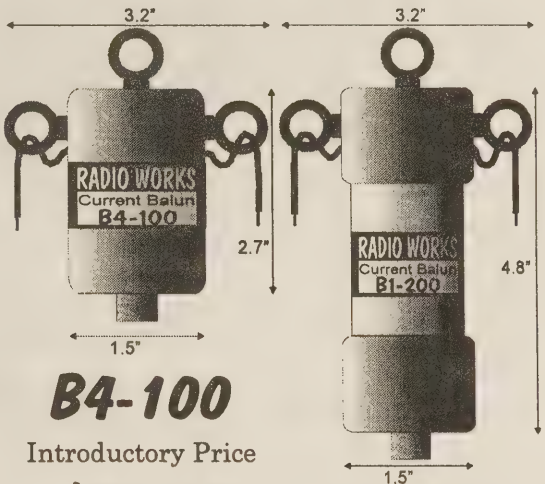
At this price, it's difficult to produce a high power balun with acceptable specifications. Sure, you can make an air wound voltage-type device that appears to take a lot of power, but its performance falls way short of acceptable standards. To achieve the needed bandwidth and efficiency on the lower bands, ferrites are required. Keeping them from saturating is the big problem. Our solution involves new ferrite types and lots of it. You can tell the difference as soon as you pick up a B1-6K. Your amplifier is no lightweight and B1-6K isn't either. The result is a bulletproof balun for your contest station. It's also the perfect balun for your 1500 watt peak AM station (375 watts of carrier). The B1-6K is made to withstand the near continuous duty-cycles common with AM'ers.

New!

B1-200

B4-100

	B1-200	B4-100
Balun Type	Current	Voltage
Ratio	1:1	4:1
Operating Bandwidth	160 - 10 m	160 - 10m
Power Loss, dB	Nil	< .5 dB
Saturation Resistant	Yes	Yes
Core Type	HF Ferrite	HF Ferrite
SSB/CW Power Rating*	200 watts if SWR < 3:1	100 watts if SWR < 3:1
Output Balance	Excellent	Excellent
Load Variation Tolerance	Excellent	Excellent
Input connector	SO-239	SO-239
Output Connector	Wire	Wire
Size	1.5" x 4.8"	1.5" x 2.7"



B4-100
Introductory Price
$25.95

B1-200
Introductory Price
$28.95

*Important: SSB/CW duty-cycles only. Not rated for AM, RTTY or other high duty-cycle modes.

B1-200 Applications: Dipoles, trap dipoles, Inverted-V, Slopers, etc. Any application requiring a 50-ohm balun.
B4-100 Applications: Any application requiring a 4:1 balun feeding 200 -300 ohm loads.

A direct connection between the balun's windings and the antenna's elements means there is no chance of an intermittent connection.

The Same Uncompromising Performance

Our new 100 & 200 watt baluns offer the same outstanding performance as the B1-2K and the B4-2K. Only the package and components are smaller to meet the need for a physically smaller balun for QRP, SWL, barefoot rigs, stealth and similar interests.

Special cores and high quality wire rated for high temperature and high dielectric ratings are used in this balun series. Now you have the parts you need to build small, carry-along antennas or those hidden antennas you've been planning. Finally, you have a precision, high spec. balun in a small size to meet your special needs.

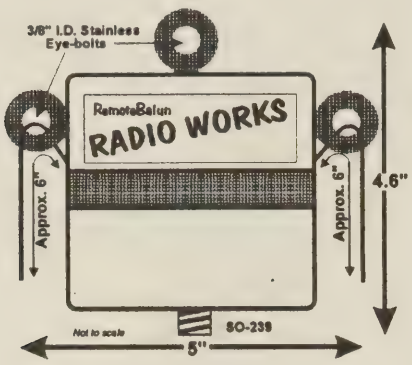
They're built just like the big baluns.

Construction is just like our other baluns. Only the case is smaller. Eye-bolts are stainless-steel, and the entire assembly is built for long life. Wires from the windings are brought outside the balun's case for direct connection to your antenna wire.

The RADIO WORKS Box 6159 Portsmouth, VA 23703 (757) 484-0140

RemoteBalun™

A 4:1 Current balun



The RemoteBalun - A Proven Solution

List Price $59.95 **Special price** **$49.95**

Balun Type	Current
Ratio	4:1
Operating Bandwidth	160 - 10 m
Power Loss, dB	< 0.8 dB
Saturation Resistance	Excellent
Internal XMSN Line Z	40 Ohms, equiv.
Core Type	2 x HF Ferrite
Power Rating @ 3.5 MHZ	1.5 KW *
Output Balance	Excellent
Load Variation Tolerance	Excellent
Recommended Coax	Low Loss Types
Recommended Coax Length	< 16 feet
Input connector	SO-239
Output connector	Wire
Size	3.5" x 3.5"

Applications: Open-wire to coax interface, external to the operating position. Use with tuner.

Power must be derated under some conditions.
CW/SSB duty-cycle only. Not rated for AM, RTTY, PSK-31 and other high duty-cycle modes.

It's New, It's Better

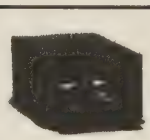
The RADIO WORKS brought you the RemoteBalun several years ago, and it was an immediate success. At the time there was no other balun on the market designed specifically for this purpose. In fact, back then, 'Current Baluns' were nearly unknown in Amateur Radio circles. As is always the case, success breeds copies, and soon there were lots of copies of the RemoteBalun (at least in name, but little more).

The original RemoteBalun was good, but we have been engineering baluns for a long time at the RADIO WORKS, and, if you do your homework, you can always come up with improvements .... and that is just what we've done!

The RemoteBalun

We increased the RemoteBalun's winding inductance without restricting bandwidth. We improved the output balance and lowered losses. We added 160 meters and increased the power rating safety factor. * We increased the high SWR load tolerance. **We made a better RemoteBalun.**

The ***RemoteBalun*** is based on the B4-2KX, network compensated, Current Balun technology. Special winding techniques insure wide operating bandwidth and high power handling. Massive ferrite cores keep everything under control, and the specifications on target. Try the ***RemoteBalun;*** *it's what an "external balun" should be.*



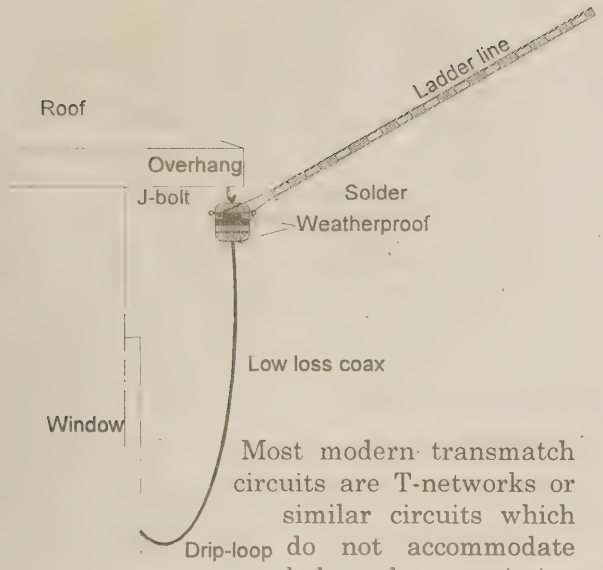
MFJ-912 Balun Box Giant 2-core 4:1 balun wound with Teflon wire, connects to high voltage ceramic feed-thru insulators. Handles full legal limit with ease.

Warranty by MFJ

3 1/4" x 2 1/4" x 7" **$49.95**

A different kind of balun -

The RemoteBalun™



Description

The RemoteBalun™ is the interface between balanced feeders and coaxial cable. The RemoteBalun™ is a rugged 4:1 current-type balun.

A short length of low loss coaxial cable connects your transmatch to RemoteBalun™. The inconvenience of routing balanced feeders into the radio room is eliminated.

Most modern transmatch circuits are T-networks or similar circuits which do not accommodate balanced transmission lines (feed lines). To provide a balanced output, a transmatch of this type will usually have a built-in balun. Unfortunately, a voltage balun is almost always used. Voltage baluns are inappropriate in this application, because they do not work well when their loads are mismatched. This is usually the case in this application. Worse, high power, especially in combination with reactive loads can cause most voltage baluns to saturate, and this can lead to TVI and other RFI problems.

To further enhance output balance, a special circuit, we call it the 'X' configuration, uses a twin core, balanced design that produces a balanced output under a wide range of conditions.

Remote baluns have a very difficult job. Baluns work best at low to moderate impedance levels. Often, a RemoteBalun will be used to drive very high impedance loads. Efficiency suffers when any balun operates under highly mismatched conditions. The power rating of the balun must be down-rated as the efficiency falls.

This is the reason for the RemoteBalun. It has more of everything - higher power rating, a wider load operating range, and a high efficiency design. A new, custom-made transmission line is used in the RemoteBalun to achieve this improved level of performance. This means that more power is delivered to the antenna, and **you have a bigger signal!**

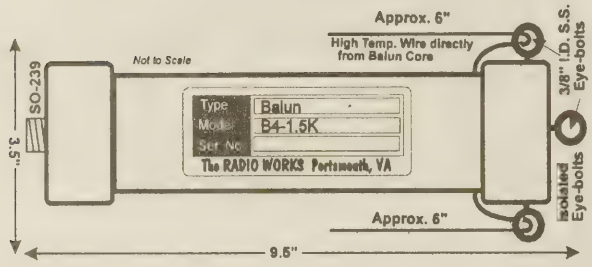
Power Rating - *Important*

The RemoteBalun's power rating is 1500 watts. Putting a specific value on this specification is not possible because the power rating depends on so many factors. The load impedance and reactance presented to the RemoteBalun, combined with the operating frequency and duty cycles, are interrelated factors which must be taken into account. The 1500 watt power rating assumes normal duty cycle modes (CW and SSB) with the balun operating into a moderate electrical environment. If you operate RTTY or other modes where the transmitter produces high power for long periods, you may have to reduce the maximum power delivered to your transmatch. The same thing holds true for very high or very low impedances.

This is a Current-type™ balun. Unlike voltage baluns, Current-type baluns maintain output balance over a wide range of loads. This makes them ideal for use at the transition between balanced feeders and unbalanced coax. As with all electrical components, there are limits. The maximum power which may be applied to the Remote Balun depends on the magnitude of the mismatch.

B4-1.5K

1.5 KW, 4:1, Broadband BALUN



L/C Compensated, Wide Band

List Price $37.95

Catalog price $32.95

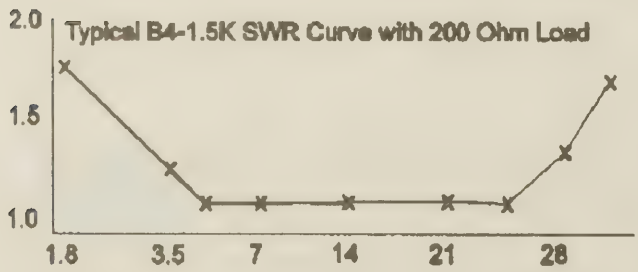
Balun Type	Voltage
Ratio:	4:1
Operating Bandwidth	80 - 10 m
Power Loss	< .8 dB
Saturation Resistant	Yes
Internal XMSN Line Z	≈ 40 Ohms, equiv
Core Type	Ferrite
Power Rating @ 3.5 MHZ*	1.5 KW if SWR < 3:1
Output Balance	Good
Load Variation Tolerance	Good
Input connector	SO-239
Output Connector	Wire
Size	2.3" x 8"

*** CW/SSB duty-cycle only. Not rated for AM, RTTY or other high duty-cycle modes.**

Applications: Folded dipoles, delta-loops, or any general 200 - 300 ohm application.

Something Special

- ✔ An effective, wideband design
- ✔ Laboratory developed & optimized
- ✔ Oversize components
- ✔ Saturation resistant design
- ✔ Special high voltage wire insulation
- ✔ L-C Network compensation = wide bandwidth
- ✔ Wire from internal windings are brought outside the case where you solder them directly to your antenna wire. No unreliable connections.
- ✔ Stainless-steel eye-bolts
- ✔ Clearly written manual



The Low-cost winner!

We have made the B4-1.5K for more than 15 years. It is a saturation resistant 4:1 design that uses a very large ferrite core. The core is nearly twice the size of conventional 4:1 baluns. Internal transmission lines are made with special, high voltage, high temperature wire. Wire insulation is similar to Teflon. Like its incomparable 'big brother,' the B4-2K, the B4-1.5K is a 4:1 Voltage-type, transmission line design. Only the RADIO WORKS' 4:1 baluns are L/C compensated for unmatched bandwidth and efficiency.

The B4-1.5K stands alone as the low-cost performance leader. No other balun provides excellent output balance, saturation resistance, wide bandwidth and low loss.

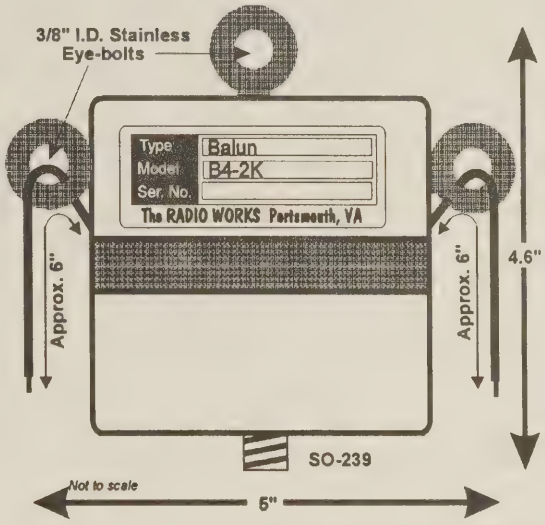
Precision, high power 4:1 balun

B4-2K

Balun Type	Voltage
Ratio:	4:1
Operating Bandwidth	80 - 10 m
Power Loss	< .6 dB
Saturation Resistant	No
Internal Xmsn Line Z	40 Ohms, equiv.
Core Type	Ferrite Toroid
Power Rating @ 3.5 MHz	1.5 KW if SWR < 3:1
Output Balance	Very Good
Load Variation Tolerance	Good
Input connector	SO-239
Output Connector	Wire
Size	3.5" x 3.5"

*** CW/SSB duty-cycles only. Not rated for AM, RTTY, or other high duty-cycle modes.**

Applications: All B4-1.5K applications. Folded dipoles, Delta-loops, or any general purpose 200 - 300 ohm applications.



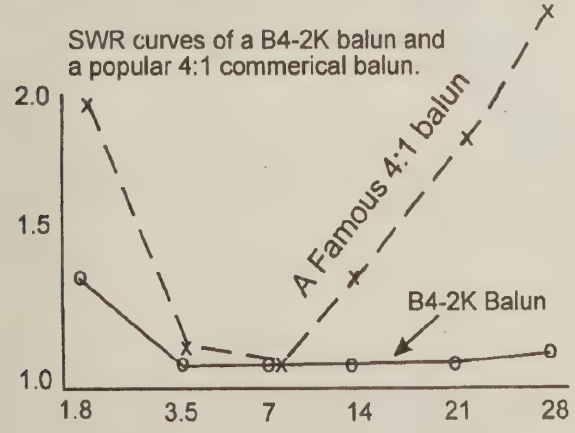
The 4:1 Balun with a 'flat' SWR curve

List Price $45.95

Catalog price $39.95

Top of the Line

- Laboratory Developed
- Fresh Design Approach
- Large Toroidal Core
- Precision transmission line design
- Special, Large Gauge, High Temperature, High Voltage Wire.
- Network Compensation for Wide Bandwidth



Something Special!

The B4-2K is a high quality 4:1 balun. Special ferrite toroids manage reactance and provide the very high inductance values necessary in a 4:1 balun. Problems with other 4:1 baluns now on the market include low winding inductance, leakage inductance, high loss, and poor balance.

In contrast, we use large, efficient, toroid cores, heavy, high-voltage wire, and special winding techniques. This combined with our exclusive L-C compensation networks achieves wide bandwidth with a high power safety factor. It's an unbeatable combination. It's an unbeatable balun.

The RADIO WORKS (757) 484-0140

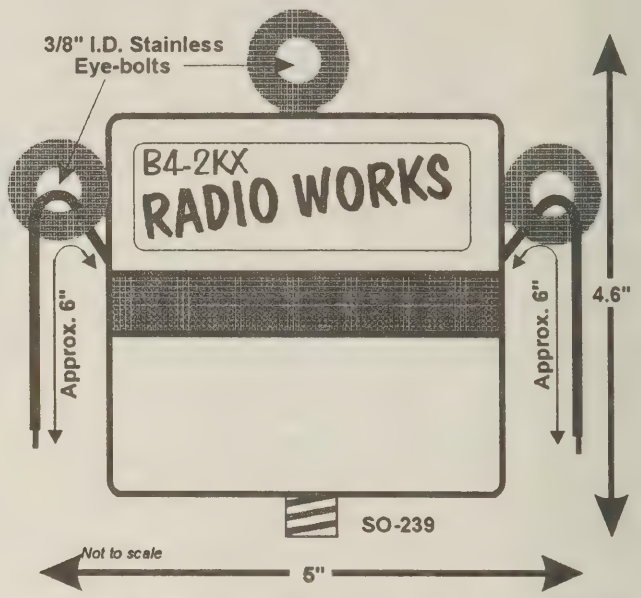
B4-2KX

4:1 High performance current balun

Balun Type	Current
Ratio:	4:1
Operating Bandwidth	160 - 10 m
Power Loss	< .8 dB
Saturation Resistance	Moderate
Internal XMSN Line Z	45 Ohms, equiv.
Core Type	2 x HF Ferrite
Power Rating @ 3.5 MHZ*	>1.5 KW SWR <3:1
Output Balance	Excellent
Load Variation Tolerance	Excellent
Input connector	SO-239
Output Connector	Wire
Size	3.5" x 3.5"

***CW/SSB duty-cycles only. Not rated for AM, RTTY or other high duty-cycle modes.**

Applications: This Current-type™ balun is suitable for all applications requiring a precision 4:1 balun. Use in wire beams, KT-series Yagis, folded dipoles, monopoles, etc.



Laboratory Standards, Amateur Radio Prices

List Price $57.95

Catalog price $49.95

The Top of the Line

- ✓ New, double-core, cross-coupled design.
- ✓ Exceptional output balance.
- ✓ Massive toroidal ferrite cores.
- ✓ Exceptionally high winding reactance is possible only with a proper L-C compensation network.
- ✓ Special, large gauge, high temperature, high voltage wire.
- ✓ Network compensation for wide bandwidth
- ✓ Rated well beyond the legal power limit.
- ✓ Stainless-steel eye-bolts.
- ✓ **This 4:1 balun works on 160 meters!**

The Only 4:1 Broadband Current Balun

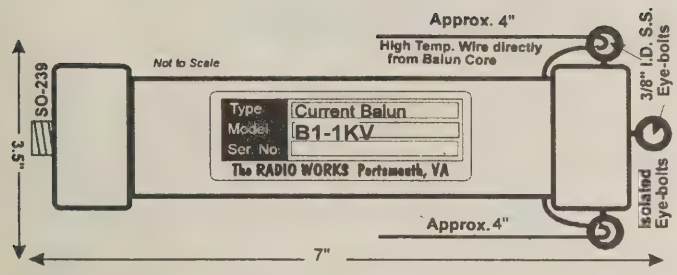
Current-type™ baluns have several major advantages over common Voltage-type baluns. Simply stated, Current-type™ baluns are more tolerant of imperfect loads while providing excellent output balance and feedline isolation. Very wide bandwidth and high power operation are additional characteristics of all RADIO WORKS' Current-type™ baluns. The electrical specifications of each RADIO WORKS balun far exceeds industry standards.

KT-32 XA BEAM

Enthusiastic users report that the B4-2KX is a bulletproof replacement for the KT-34 or KT-34XA balun.

B1-1KV

'VHF' 1:1 Current Balun



B1-1KV Specifications

Type:	Current
Ratio Input/Output:	1:1
Design Impedance:	50 Ohms
Internal xmsn line Z:	50 ohms
Bandwidth:	15 - 2 meters
Winding Z @ 21 MHZ:	1000Ω +
Winding Z @ 144 MHZ:	1000Ω +
Coefficient of coupling:	100%
Power loss in dB:	Nil
Power handling CW/SSB:	1.5 kW @ 28 MHZ
Not rated for high duty-cycle modes	500 W @ 50 MHZ
Input connector:	SO-239
Output connector:	Wires

CAUTION

At 10 meters and VHF frequencies, allow for the balun's output leads. They are part of the antenna. The length of each lead is exactly 4" from the balun's windings to the end of the output wire.

NEW - Now made with a new HF/VHF ferrite material for even better specs.

A VHF Balun?

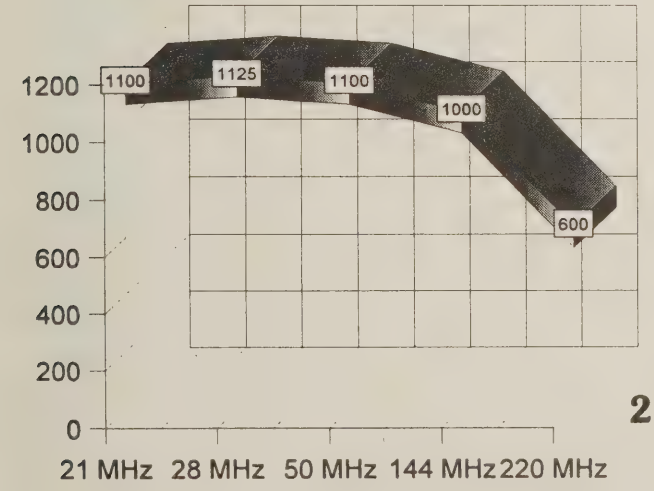
Yes! At HF frequencies, it is difficult to build a 1:1 balun that is tolerant of realistic operating environments where mismatched loads are more the rule than an exception. Unless a balun is very carefully designed, you can expect poor output balance and core saturation. We were able to overcome all these problems at HF frequencies with the B1-2K and B1-5K. At VHF, new problems arise. Transmission lines must be very short in terms of a wavelength; special ferrites must be used and they must be effective over a very wide frequency range. Every construction detail must be carefully specified if each balun is to perform as required. We have met and again exceeded all expectations with the new B1-1KV. It will be the standard others will attempt to reach in their 1:1 VHF baluns.

Applications

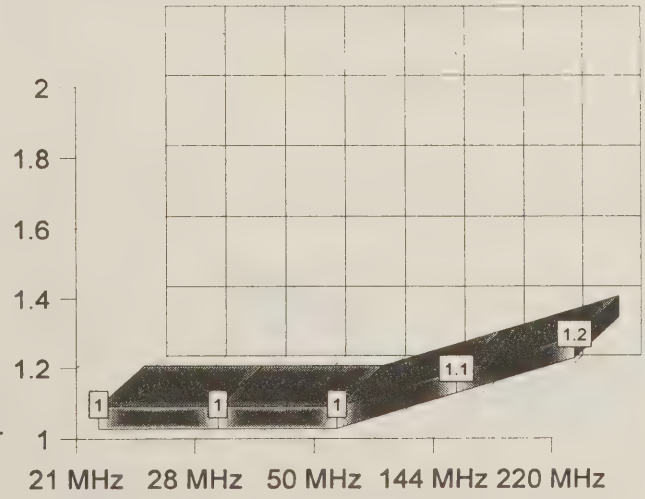
Any 50-ohm application that requires a 50-ohm-to-50-ohm unbalanced-to-balanced interface. It is suitable for use in dipoles, vertical dipoles, wire beams, etc.

List Price $33.95
special catalog price **$29.95**

Isolation Reactance



B1-1KV's SWR with non-inductive load



B4-1KXV

VHF 4:1 Precision Current-type Balun

Specifications

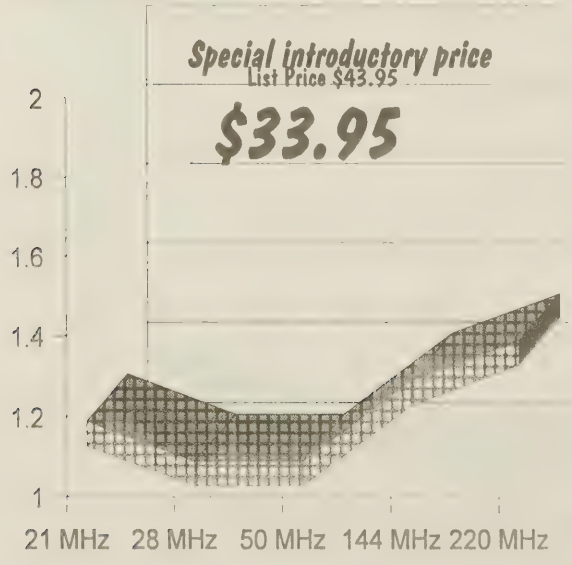
Type:	Current
Ratio:	4:1
Bandwidth:	15 - 2 m
Coefficient of Coupling:	99+%
Power Loss in dB, matched:	Nil < .1
Saturation Resistant Core:	Good
Internal Transmission Line Z:	47 Ohms
Core:	Ferrite
L-C Compensation:	No
Power Rating @ 50 MHz, CW/SSB	500 W*
Output balance:	Good
Load variation tolerance:	Excellent
Input Connector:	SO-239
Output Connector:	SO-239
Eye-bolts for wire attachment:	Yes
Size:	2.3" x 7"
Weight (approximate):	7 oz.

*** CW/SSB duty-cycles only. Not rated for Am, RTTY or other high duty-cycle modes.**

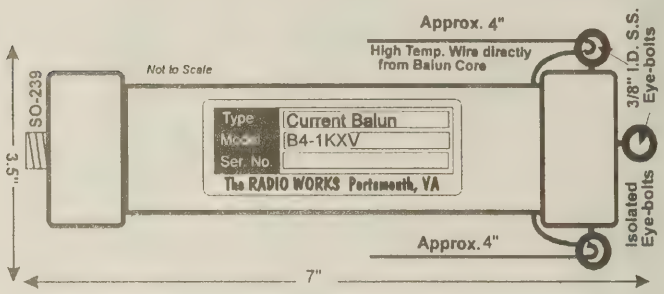
Applications

The B4-1KXV VHF Current-type balun is suitable for all applications requiring a precision, 4:1 balun. Use with wire beams, including OCF types, folded dipoles, folded monopoles, or any application requiring a 50:200 ohm unbalanced-to-balanced application.

Now made with newly developed HF/VHF ferrite for even better performance.



Sets the Standard in VHF Baluns



*** A true, Current-type 4:1 Balun**

*** Double-core, cross-coupled design.**
*** Very Good output balance.**
*** Special Ferrites for High HF + 6 & 2 m**
*** Teflon Components.**
*** Wide bandwidth with carefully controlled reactance characteristics.**
*** The same, first-class construction as all the B-series HF baluns. Made to last for years.**
*** The original VHF 4:1 Current-type Balun, using the same technology as the incredible, B4-2KX precision HF balun.**

At HF frequencies, it is difficult to build a 4:1 balun that is tolerant of realistic operating environments where mismatched loads are common. Unless a balun is very carefully designed, you can expect poor output balance and core saturation. We were able overcome these difficulties on HF with the B4-2KX. At VHF frequencies, new problems arise. Transmission lines must be very short in terms of a wavelength, special ferrites must be used and they must be effective over a very wide frequency range. Every construction detail must be carefully specified if each balun is to perform as specified. We have met and again exceeded all expectations with the B4-1KXV. It will be the standard others will attempt to reach in their 4:1 VHF baluns. At this time, I know of no other 4:1 VHF balun on the market and certainly none with the credentials of the B4-2KX.

If your VHF antenna project requires a 4:1 balun, you can't make a better choice than the incomparable B4-1KXV.

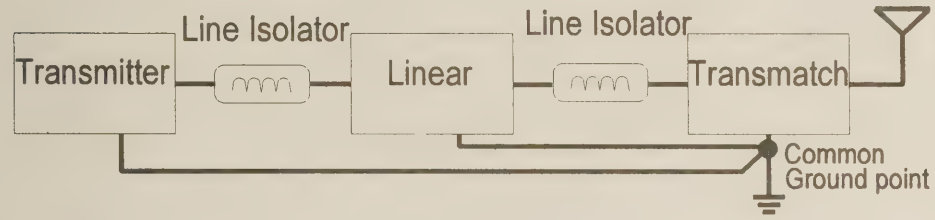
CAUTION- At 10 m and VHF frequencies, balun lead length must be taken into account. They are part of the antenna. The length of each lead is exactly 4" from the balun's windings to the end of the wire.

Line Isolators
The RFI Quick Fix!

Multiple ground loops around various pieces of equipment can cause all sorts of problems. But, rather than getting deeper into a technical discussion, let's just try to avoid problems before they cause trouble. Solving the ground loop problem may be as simple as adding Line Isolator[tm] in series with the interconnecting coaxial cables between station equipment.

The Ground Loop Solution

First, eliminate the heavy copper strap running along the back of the station equipment. Use the transmatch (tuner) as a common ground point, 'Ground Central.' The heavy gauge wire from your outdoor ground system will connect directly to the 'common ground point' on the back of your transmatch (tuner). Each piece of equipment will then be connected directly to this 'common ground point'.



Actually, each piece of equipment is already connected, in a round about way, to the transmatch (tuner) through the various pieces of coax that interconnect station equipment. Of course, it is this "round about way" that contributes to the ground loop problems. We can't eliminate the ground braid on the coax, but we can break up the external ground loops they can cause with Line Isolator[tm].

LINE ISOLATOR[tm] The Line Isolator[tm] installation shown above works well for most stations. When a transmatch (tuner) is not used, it is often very effective to use a second, grounded Line Isolator[tm] between the Linear and antennas. This grounded Line Isolator is located at ground level and has a built-in strap that connects directly to a ground rod. This greatly enhances the effectiveness of a Line Isolator[tm] by providing a direct path to ground in combination with the very high isolation inductance.

Customers report that Line Isolator[tm] inserted in series with the cables interconnecting the transceiver, linear and transmatch (tuner) have eliminated stubborn RFI problems that resisted solutions by any other means.

HOW IT WORKS A Line Isolator[tm] prevents RF from traveling along the outer surface of a coaxial cable's shield. Any RF current flowing on the coax cable's shield can be radiated or coupled to other equipment. With Line Isolators[tm] in the circuit, that unwanted RF is forced to ground by the very high impedance of the Line Isolator[tm]. RF current takes the path of least resistance. Of course, the Line Isolator[tm] does not affect the signal inside the coaxial cable.

As a secondary benefit, a Line Isolator[tm] installed between your transceiver and linear amplifier helps the transceiver's output filters perform more effectively by breaking secondary leakage paths and forcing the transceiver's output to function properly.

The RADIO WORKS Box 6159 Portsmouth, VA 23703 (757) 484-0140

RF GROUND SYSTEMS

The UN-GROUND . . . . Ground systems that aren't . . . .

General Rules

1. You must have an RF ground system.
2. Any ground run over 8-feet will be ineffective on some bands!
3. Use "single-point" grounding.
4. Never, ever use the ground terminal of an electrical socket as station ground!
5. Don't use water pipes for grounds.
6. Always install a proper RF ground system using large gauge wire, or preferably, wide copper straps. If 2" or 3" wide copper strap is not practical, use flexible, tinned-braided ground strap between ½" and 2" in width.
7. Do not take your ground system for granted, it's just as important as your antenna.
8. It is impossible to establish an effective RF ground system if your station is on the second floor or higher.

From the telephone calls we receive, many of you are having problems with RF ground systems. RF ground? Yes, most of us have ground systems that provide adequate DC grounding. Unfortunately, a good DC ground system may not be a good RF ground system. In fact, you may have a 'UN-GROUND.'

UN-GROUND? Absolutely. There are situations where your ground system may actually un-ground your station. The reason lies in the fundamental difference between DC and RF circuits.

IMPEDANCE	Definition
The total opposition (resistance and reactance) a circuit offers to the flow of alternating current. Impedance is measured in ohms. The common symbol is Z.	

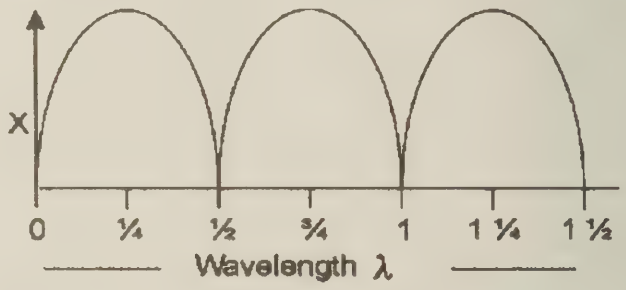
REACTANCE	Definition
Symbolized by X, it is the opposition to the flow of alternating current. Capacitive reactance (X_C) is the opposition offered by capacitors, and inductive reactance (X_L) is the opposition offered by a coil or other inductance. Both are measured in ohms.	

Any wire will have inductance and, therefore, inductive reactance. The longer the wire, the higher the inductive reactance and the higher the opposition to the flow of RF current. The fatter or larger the wire, the lower the opposition to the flow of RF current. The effect is similar to the DC resistance of a wire. The longer the wire, the higher the DC resistance will be.

The fatter the wire the lower the DC resistance for the same length wire. There is an important '*however*,' that we must consider. When the X_L (inductive reactance) is measured along the length of a wire, the magnitude of X_L (the opposition to RF current flow) varies from very low to very high values. It continues to alternate between low and high values in cycles that have a direct relationship between the length of wire and the frequency of the applied RF energy. DC resistance, on the other hand, has no cycle. It simply increases linearly with the length of the wire.

When measuring X_L, its value is very high when the length of the wire is around one-quarter wavelength long. Increasing the length wire to one-half wavelength, returns X_L to a low value.

The length of the wire does not have to be very long for this effect to be observed. For example, at 28 MHz **an 8' ground wire** (or any wire for that matter) is approximately one-quarter wavelength long. If this 8 foot long ground wire connects your 10 meter rig to your ground system, the ground wire may actually prevent RF from traveling to ground. This is an **UN-GROUND!**



Reactance vs Wavelength
Figure 1

Why? As illustrated above, the inductive reactance of wire that is one-quarter wavelength long is very high and impedes RF current flow (thus the term - impedance).

On other bands, where the length of the wire is not an odd multiple of a quarter wavelength long, the inductive reactance (X_L) is at some intermediate or low value.

High RF Voltage

Figure 2 shows a grounding diagram of a typical ham station. There is a heavy ground strap running along the back of the equipment. The ground strap eventually reaches the earth ground system, a ground rod, through a heavy gauge copper wire 11 feet in length. The ground connection for each piece of equipment goes directly to the heavy ground strap that runs behind the station equipment. **The antenna is a ladder-line fed, 80 meter dipole** used on all bands. The ladder line is brought directly into the operating position where it connects to the balanced output of the transmatch. The ladder line is about 60 feet long and goes directly to the antenna but passes very close to a metal rain gutter. Such a station should be effective and trouble free. Unfortunately,

this station is experiencing problems on the higher HF bands. There is RF feedback distorting the transmitted signal, and there are some TVI and RFI problems. What could be wrong?

If we tune up on 20 meters, the 80 meter dipole becomes a center-fed, two wavelength antenna. **The feedpoint impedance is around 4500 ohms.** The length of the ladder line feeding the antenna is about one wavelength long. It is a characteristic of transmission line that it will duplicate its load impedance every half-wave along its length. So, the very high antenna feedpoint impedance appears right

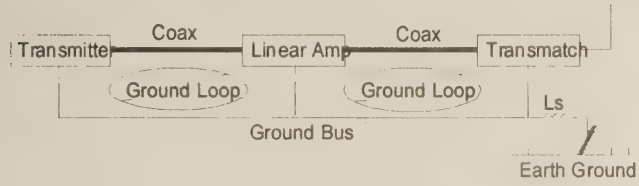


Figure 2 Ground System of Typical Station

at the transmatch's output terminals. However, before reaching the transmatch, the ladder line runs very close to a metal rain gutter. Feedline balance is upset, and it begins to radiate at that point.

The transmatch uses a voltage-type balun to create a balanced output. Baluns do not work well in high impedance circuits, and **voltage-type baluns are especially bad in this application**. With a high impedance load, the voltage balun's core will saturate even at moderate power levels. Output balance is poor.* This contributes to additional radiation from the balanced line.

In this illustration, we have several problems, each compounding the other. First, all of the ground system and ground loop problems still exist, but we now have a transmatch balun that is saturating and generating high level harmonics. Signal distortion may be noticeable because the balun is no longer operating in its linear region. The ladder-line is not balanced so it radiates, and the equipment at the operating position becomes part of the antenna system. Here is a real shocker! There is RF all over the equipment. The Microphone is biting your lips. Your computer crashed. The packet TNC will not talk to you anymore, but none of this matters because the station power supply shut itself down and you are off the air. Sound impossible? Unfortunately, it's not. This is a true story and this isn't the end.

The ground wire is about 11 feet long. On 15 meters, this length is almost exactly 1/4 wavelength. One end is at low impedance, so the other end presents a high impedance to the circuit connected to it. In other words, the ground wire is near zero impedance at the ground end, but due to the impedance inverting characteristic, the station equipment 'sees' a very high impedance at the equipment end of the ground wire. In effect, the equipment is UNGROUNDED at high RF frequencies. Refer to figure 1.

On 20 meters, the 11 foot ground wire is .15 wavelengths long. Referring to figure 1 and interpolating between zero and 1/4 wavelength, the inductive reactance of the ground wire is still quite high. To our station equipment, the **ground wire simulates an inductive reactance in series with the resistance of the ground wire**. This is illustrated by the coil L_S in figure 2. We'll disregard the DC resistance of the ground wire.

Without getting into great detail, let's just agree that it would be better if the station had a direct, low impedance path to ground. In this illustration, this is not the case. **The path to ground is a high impedance on the higher frequency bands.** In fact, there are alternate grounds available to the station equipment. Other, undesirable, ground paths may present a lower impedance path to earth or may act as a counterpoise. Unfortunately, one of those ground systems is the electrical power lines at the operating position. RF from the transmitter, seeking a ground path, may have to pass by or through several electronic appliances (TVs, VCRs, etc.) that would work better if they were isolated from your transmitting equipment.

Due to the inductive reactance of the ground system, none of the equipment in this station is effectively grounded on the higher HF bands. If an RF potential exists on the station ground system, **the entire station may 'float'** up to that RF potential. Thus, the earth ground reference is actually several volts above ground. All sorts of RFI problems can be the result, including RF feedback into station microphones, computers, TNCs, power supplies, etc.

Solid state equipment is especially sensitive to ground problems.

Solid state equipment is especially sensitive to ground problems. Each piece of equipment in figure 2 is interconnected by two ground paths, a ground strap and the coaxial cable that interconnects the equipment. The two paths form a ground loop, as shown in figure 1. Since there is high system gain involved from the millivolts of the transceiver's input circuits to the kilovolts of the linear's output circuit, ground loops can be a serious problem. It's even worse if the ground system is ineffective and the entire station is 'floating' above ground. Breaking the ground loops can lead to the solution to long unsolved RFI problems.

The RADIO WORKS' Line Isolators™ are very effective in solving ground loop problems.

The Shocking Truth

Have you ever calculated what the voltage across a 4500 ohm reactive load is at 1.5 KW? It is more than a few volts. Actually, it's a few thousand volts. It's unbalanced, and it's looking for somewhere to go. As we predicted in previous paragraphs, the antenna feedpoint impedance and corresponding high RF voltage is transferred directly across the output terminals of the transmatch. **Several thousand volts of RF** is only a few feet away and at RF, the station is poorly grounded.

I'm not going to bore you with a lot of math, but let's simplify this situation to a simple series circuit. In figure 2, the antenna, transmatch, and ground system are represented by a simple voltage divider. This simple circuit will allow me to illustrate what is happening to the ground bus in the ham shack.

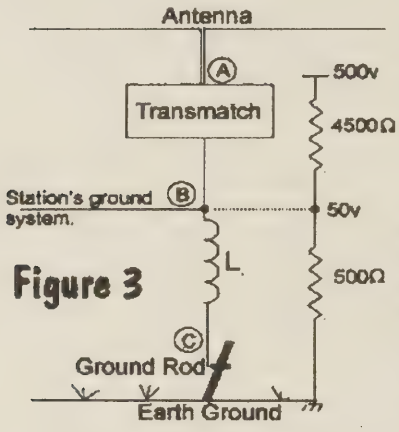


Figure 3

First, let's assume the voltage at point 'A' on the transmatch is 500 volts. It is really much higher. The impedance at the output terminals of the transmatch is 4500 ohms, and the reactance of the ground system is 500 ohms. I did not calculate the value for the ground system, the 500 ohm value is for illustration.

Reducing the problem to its simplest terms, we have a 4500 ohm resistor in series with a 500 ohm resistor. The ground system is the tap between the two. In this example, if there are 500 volts at the transmatch, the station ground system will 'float' above earth ground. The potential is about 50 volts. Your ground system and all your equipment, in effect, have 50 volts of RF applied to the equipment grounds. **This is just like having a 50 volt input signal** if the input circuits were at ground potential.

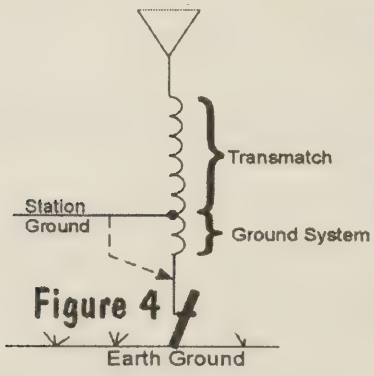


Figure 4

Another way to look at this problem is to visualize the antenna and ground system as a big coil that represent the inductive reactance of the ground system and transmatch. The antenna is at one end of the coil and the ground is at the other. We are tapped several turns up the coil. The higher the impedance of the ground system, the higher up the coil the 'tap' is located. The only way to keep RF off the station equipment and station ground is to move the point were the rig is tapped into the coil closer to ground.

Of course, it's never this simple. My numbers are only representative, but they do serve as an illustration. **The RF voltage on the station ground system does reach very high levels** under some circumstances. I have had hams tell me of severe RF burns and visible 'arcing' from microphones, equipment chassis, ground busses. Obviously, at these levels of RF voltage, there will be terrible problems. But, what happens when the RF voltage on the ground system is only a few volts? You may not know that RF energy is there, causing RFI or other problems.

An Effective Station Ground

The station ground must provide both effective DC and RF grounding. Creating a good DC ground is not a problem, but an effective RF ground must be carefully planned.

The ground system should generally follow these suggestions:

(1) The ground wire should be as short as possible, preferably much shorter than a quarter-wavelength long on the highest frequency band operated.
(2) The ground wire should be very large. I sometimes use the braid removed from a piece of RG-213. Better yet, use one or more lengths of 1/2" or 1" tinned braided strap.
(3) Clamp this short, heavy ground wire to your ground rod(s) or radial system.
(4) Use several different lengths of ground wires in parallel, each connected to a separate ground rod. This provides multiple, parallel ground paths.

GROUND SYSTEMS

SIMPLE - a single ground rod driven into the earth just outside the ham shack.

INTERMEDIATE - Several ground rods, connected in parallel with very heavy wire, solid copper strap or braided strap.

ELABORATE, and very effective - 25 short (6-12") ground rods spaced approximately 4' apart and interconnected in series by a 100' length of heavy braided wire. This system is very efficient. The original design used stainless-steel pegs for ground rods and stainless steel wire to prevent efficiency reducing corrosion. Copper will loose it effectiveness after a very few months or years due to the oxidation of the copper surface. Regular ground system maintenance is necessary.

What appears on these three pages is only part of an article that has appeared in several of my publications. You can read the entire article by going to my web site at www.radioworks.com and looking in "Jim's Notebook" under "Ground System Problems and Solutions"

A note from Doug DeMaw, W1FB

You saw Doug DeMaw's columns in the pages of Ham publications for many years.

"Speaking of the 4KRF-LI and T-3 (both now replaced by the even more effective T-4), Doug writes ....."have just now had the opportunity to test the products in my system (as isolators between the Transmatch and the remainder of the station). Both units work beautifully. There was no SWR change from my home-made, ferrite-loaded isolator choke, and no evidence of heating existed at maximum legal amateur power! ....."

..... "One of the applications I want to mention in the review is that of isolating solid-state transceivers from the currents that flow on the outer conductor of coax when operating from RVs at fixed locations. My Kenwood TS-140S and TS-450S go bananas at power levels above 50 watts when I try to operate from my camp trailer without an earth ground. The Terminator-3 (now T-4, Jim) cures the problem, and RF energy does not disrupt the functions of the transceiver. Of course the units will be recommended also for isolators at the feed points of Tribanders, etc. ...."

Used with permission

PCLI - Power & Control Lead Line Isolators™

Due mostly to popular request, we are now offering an entirely new line of isolators. These are designed to take care of some RFI and noise problems not solved by the RF Line Isolators™ (i.e., the T-4, etc.).

It has become obvious by the number of ferrite "snap-on" cores that we sell that the control lines and power cables interconnecting rigs and accessories need lots of effective help with RFI problems. While the "snap-on" cores are quite effective, there are saturations where you would have to use dozens of cores to get the job done. A more effective solution was needed. An obvious choice, with its incredibly high isolation factor (very high inductive reactance), is a Line Isolator™ modified to handle d. c. power cables and other control cables. Specifically, requests came in from those needing high isolation for cables controlling external automatic tuners, rotator cables, and mobile power leads. Many of these requests came from marine interests, but a substantial number arrived from home based stations, too. Thus, as we always try to meet our customer's needs, the new PCLI line of isolators is being made to address these problems.

The "snap-on" cores are still appropriate in most situations where problems are minimal, or when it's not convenient to install the new PCLI's. Also, remember that these devices do not substitute for poor grounding techniques. With modern equipment, you need a technically correct RF ground installation AND appropriately installed Line Isolators™.

New! Power & Control Line Isolators™

Introducing

2 New "RF Terminators™" in the war against TVI, RFI, and RF feedback.

Joining our fabulously successful "Terminator™" series of Line Isolators are two new, special purpose Line Isolators for use in power cables and control lines. They are used in combination with our highly capable RF Line Isolators which include the new T-4-500, the T-4, T-4G, T-5G, T-6 and T-6G. The RF Line Isolators provide very effective coverage of the entire RF spectrum from below 1 MHz, all the way up to 300 MHz. The results achieved by these devices have been truly remarkable. They are the solutions to problems that have resisted solutions for years. Recently, the marine industry discovered that the "RFI Quick Fix™" (that is, our Line Isolator) is the simple answer for serious ground loop problems that exist in many marine applications.

As effective as the RF Line Isolators are, one piece was missing from the puzzle - a very high isolation device from power and control leads of transceivers, TNC's, automatic tuners, and all manner of other electronic equipment. Thus, the "Power & Control Line Isolators™" were born. A PCLI™ comes to the rescue and prevents RF from being distributed by power and control lines of electronic equipment in the radio room whether it is on a boat, RV or in your hamshack at home.

In the past, we've used ferrite beads and cores to control RF on power and control lines, and they were reasonably effective. However, in severe cases or where you just want extra insurance against problems occurring, the PCLI™ provides an order of magnitude improvement over a string of ferrite beads or cores.

The two most obvious uses of the PCLI™ are in the power supply leads of transceivers and ancillary equipment as well as in the control leads of automatic tuners (especially those used right at the base of the antenna). In fact, we have been asked to provide just such devices by many who have had to go to extraordinary measures to solve problems that PLCI's could easily remedy.

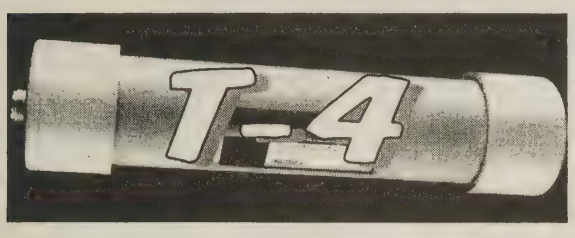
We are introducing two new units. There is a two-pin version designed for low voltage power lines carrying up to 20 amps of d.c. current. The second unit is a four-wire isolator for general use in control cables. The same unit is used in pairs in rotator control cables. This is an important application because rotator control cables are often responsible for providing a direct path into the radio room for stray RF. Another prime use is in the control cables of remotely located automatic tuners. Since these tuners are located right at the base of an antenna, RF voltage can be very high and the RF field is intense. Control cables provide a convenient path for RF to enter the operating position. There are literally dozens of other uses that will be unique to each radio installation. After all, the stray RF from the transceiver's or linear's transmission lines can be eliminated with a T-4, but RFI can still remain a problem. If so, the next step is to clean up power and control lines. And, that's just what the PCLI's do.

Ferrite cores, like our snap-on types are still required on cables that are not appropriate for the PCLI's. These are microphone cables and the hundreds of other interconnect and interface cables typically found in any radio installation. Snap-on cores are easily installed where it would be impractical to make up connectors for PCLI's.

So, we now have a three-pronged strategy in the war on RFI and RF feedback. The RF "Terminators™" (T-4's, T-5's and T-6's), Power and Control Line Isolators™ (the PCLI series), and the new, and wonderfully efficient ferrite cores that we currently offer that will fit any cable up to .25" or .5" depending on the core type.

T-4 Plus & T-4G Plus

USED AT "VOICE OF AMERICA" TO SOLVE GROUND LOOP PROBLEMS



T-4 $34.95
T-4 Plus $38.95

T-4G $37.95
T-4G Plus $41.95

T-4, T-4 Plus & T-4G, T-4G Plus Specifications

Type:	Current
Ratio Input/Output:	1:1
Design Impedance:	50 ohms
Internal xmsn line Z:	50 ohms
Bandwidth:	160 - 10 (160 - 6 on T-4 Plus)
Winding Z @ 3.5 MHZ:	>33 K
Winding Z @ 14 MHZ:	>50 K
Winding Z @ 50 MHz	>4 K (T-4 Plus only)
Coefficient of coupling:	100%
Power loss in dB:	Nil
Power handling: *	> 1500 watts
Input connector:	SO-239
Output connector:	SO-239

* CW/SSB duty-cycle only. Not rated for AM, RTTY or other high duty-cycle modes. Derate power @ 28 MHZ.

A Universal LINE ISOLATOR?

Yes! We used to make many different models of Line Isolators, each designed for a specific purpose. Then came the T-4. It is so good that it replaced all of the models needed for special applications. Not only did it replace all those other models, the T-4 produces better results. The isolation-factor is nearly 150% better than original values available in early models, and the leakage path through the Line Isolator has been practically eliminated. Now we've improved the you can use the T-4 as the Line Isolator for vertical antennas (a very important application). It's unbeatable as a ground-loop isolator when used between your transceiver and linear amplifier or between the linear amplifier and transmatch (tuner).

The T-4 Plus & T-4G Plus

The "Plus" versions of the T-4 add increased isolation at higher frequencies. With most of today's new rigs featuring all bands including 6 meters, we've developed a Line Isolator for these new rigs. You get all of the performance of the T-4, plus the added performance of improved ferrites which work well into the VHF range.

T-4G Plus

The T-4G Plus is the grounded version of the T-4 Plus. Its ground strap provides a direct path to earth so that RF traveling along the outside of the coaxial cable's shield sees a path straight to ground. Any stray RF heading for your shack sees only a very high impedance and seeks the direct ground path. The T-4G Plus should be located directly at a properly installed ground rod or other station ground system. In applications where access to earth ground is not possible, use the T-4 Plus.

Jumpers and connectors of your choice.

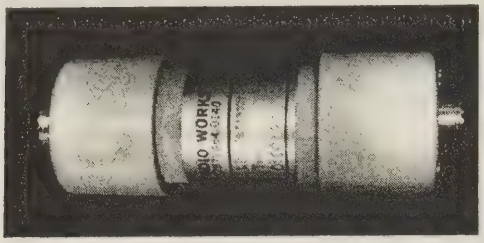
All Line Isolators have SO-239's at their input and output. This permits you to use jumpers of the required length, with the connector of your choice for the application.

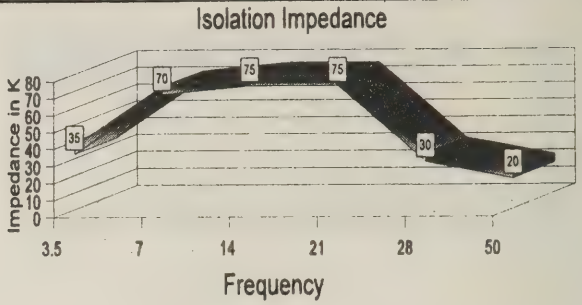
Accessories

We have a selection of manufactured jumpers available at low prices. Or, better yet, have custom jumpers built to match your needs.

T-4-500 Line Isolator

New "500 watt" Line Isolator with exceptional performance





T-4-500 $29.95

Specifications

Type:	Current
Ratio Input/Output:	1:1
Design Impedance:	50 ohms
Internal xmsn line Z:	50 ohms
Bandwidth:	160 - 6 m
Winding Z @ 3.5 MHZ:	35 K
Winding Z @ 14 MHZ:	75 K
Coefficient of coupling:	100%
Power loss in dB:	Nil
Power handling: *	500 watts, 100 watts on 50 MHz Max**
Input connector:	SO-239
Output connector:	SO-239
Size:	1.5" x 4.8"

* CW/SSB duty-cycle only. Not rated for high power AM, RTTY or other high duty-cycle modes.
** 500 watts if SWR is < 3:1

A Smaller, More Powerful LINE ISOLATOR?

Yes! To compliment our new line of Current Baluns and matching transformers for our CAROLINA WINDOMS, we continued followed up with what has turned out to be an incredible pair of Line Isolators[tm]. The isolation factor is actually higher than the standard models. They are far smaller in size and weight, too. The only real difference is the power rating. That rating is 500 watts in SSB and CW service. That makes them perfect for interconnecting a transceiver and a linear amplifier. In low power installations, considerable space can be saved using these new units.

Of course, these units are ideal for mobile and marine service when applicable. I'm going to use the T-4-500's in all the low power coaxial cables in my new digital station where isolation of computer components from stray RF is critically important.

So Much Performance In Such a Small Case?

It's the result of an ideal compromise between selected ferrite cores and the resulting very high inductance windings while maintaining the critically short winding lengths. Even though smaller in size, all windings and the special cores work in together to produce excellent insolation while keeping loss through the device to an absolute minimum. The loss is so low that it is essentially zero at HF frequencies. Add the high isolation factor to the extended, wide effective bandwidth, and the T-4-500 is the perfect Line Isolator for use in low power installations.

Jumpers and connectors of your choice.

All Line Isolators have SO-239's at their input and output. This permits you to use jumpers of the required length, with the connector of your choice for the application.

Accessories

You need a short jumper to connect the T-4-500 to your equipment.

We have a selection of manufactured jumpers available at low prices. Or, better yet, have custom jumpers built to match your needs.

T-5G

A T-4 plus a T-6 in one case
An Even Better Line Isolator

$49.95

T-5G Specifications

Type	Current
Ratio Input/Output	1:1
Design Impedance	50-ohms
Internal xmsn line	50-ohms
Bandwidth	160-2 m
Winding Z @ 3.5 MHz	>75K
Winding Z @ 14 MHz	>50K
Winding Z @ 50 MHz	>1000 ohms
Coefficient of coupling	100%
Phase delay @ 3.5 MHz	6.2 degrees
Power loss in dB	Nil
Power rating	4000 watts *
Input connector	SO-239 ST
Output connector	SO-239 ST

* power rating with SWR < 3:1 SSB/CW duty cycles

Added Isolation at VHF frequencies

The incredible T-4G has been further upgraded through the use of special ferrites and winding techniques which extend the T-5G's isolation into the VHF spectrum. This is important with today's solid state transmitters which use broadband output amplifiers. Wideband power amplifiers often produce energy from the low HF frequencies to the VHF region. Filters are used in the output stages to reduce this RF energy to tolerable levels, but the filters in the transmitter are only so good and problems are exacerbated when ground loops develop around the communications system. The T-5G solves this problem by helping break up ground loops and keeping RF off the coax's shield well into the VHF spectrum. The result is a cleaner communication system and less interaction between HF and VHF equipment. The T-5G is used with HF equipment. *The T-6G is used with VHF equipment.*

Why two ground straps?

In communications equipment, signals travel in two direction. The receiver can pick up trash collected by a coax cable's shield acting as a random length antenna. The ground strap nearest the antenna provides a direct path to ground for RF impressed on the shield from outside sources.

When transmitting, if the transmitter is not well grounded, unwanted RF can appear on the station's ground system and be conducted and radiated by the coax's shield. Thus, for maximum isolation, two ground straps are used.

If the T-5G is used in conjunction with earth ground systems, it is best to provide each ground strap with its own ground rod.

If the T-5G is used at the transmitter end of the coax, ground the transmitter end of the T-5G directly to the transmitter's ground and the other end to your ground system.

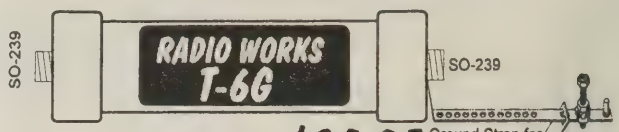
What we are doing here is to provide a direct path to ground, eliminating the condition where one end of the Line Isolator is looking at a very high inductive reactance before going to ground. The two grounds could have been connected internally, but, at VHF frequencies, an internal ground loop could be developed by the Line Isolator itself. This method provides the most flexible installation and maximum isolation in both receive and transmit operation.

The best parts, the best design

Only the best parts are used in the T-5G, from the Teflon insulated wire to the silver plated, Teflon insulted connectors.

NEW! T-6 & T-6G *'VHF' LINE ISOLATOR AND RFI TERMINATOR™*

Introductory price is only $31.95



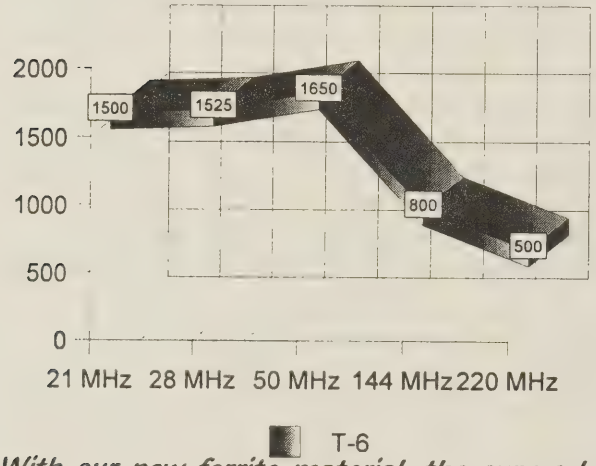
Introductory price is only $34.95

T-6 & T-6G Specifications

Type:	Current
Ratio Input/Output:	1:1
Design Impedance:	50 Ohms
Internal xmsn line Z:	50 ohms
Bandwidth:	15 - 2 meters
Winding Z @ 21 MHZ:	1.5K
Winding Z @ 144 MHZ:	1.6K
Coefficient of coupling:	100%
Power loss in dB:	Nil
Power handling, CW/SSB:	1 KW @ 28 MHZ*
	500 W @ 50 MHZ*
Input connector:	SO-239
Output connector:	SO-239

* Not rated for AM, RTTY or other high duty-cycle modes.

Isolation Reactance



With our new ferrite material, the curves have improved 2;1 over the older ferrite types.

T-6G

The T-6G is the grounded version of the T-6. It provides a direct path to ground so that RF traveling along the coaxial cable doesn't see a path back to the operation position. It is a very effective way to eliminate RFI leaving or entering the shack.

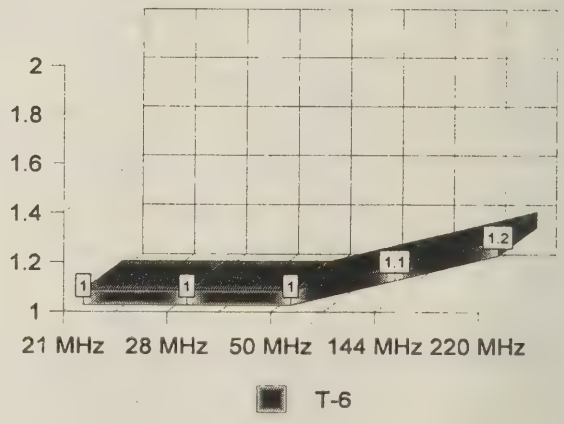
A VHF LINE ISOLATOR?

Yes! Even at VHF, you will find the T-6 as useful as the T-4 is on HF. The T-6 is perfect for use with vertical antennas of all types. Why put up a terrific beam with a good front-to-back ratio and then let feedline line radiation spoil the antenna's pattern?

Ground loop problems can still be a problem on 6 meters and the T-6 can help eliminate them. What the T-4 has done with RFI problems on HF, the T-6 will do on the upper HF bands plus 6 and 2 meters.

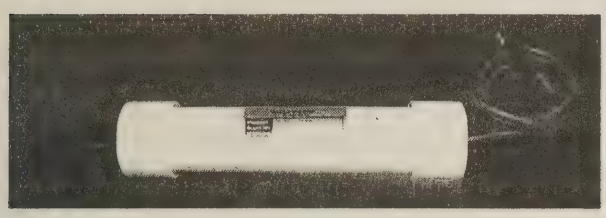
You may notice in the spec. sheets that the T-4 and T-4-300 have excellent specs. on 6 meters. Why use the T-6? It has to do with the winding in the isolator. It's important to avoid resonance near any frequency of operation. In the case of the T-4, resonance is between 10 and 6 meters. With the T-6, resonance is above 2 meters. This is important for proper operation and maximum isolation.

T-6 SWR with non-inductive load



PCLI-2 & PCLI-4

POWER AND CONTROL LINE ISOLATORS



	PCLI-2 $35	PCLI-4 $35
Type:	Current	Current
Conductors	2	4
Current Radting	20 A	2 A
Isolation Bandwidth	1 - 150 MHz	1 - 150 MHz
Winding Z @ 3.5 MHz	20 K	70 K
Winding Z @ 14 MHz	100 K +	200 K
Winding Z @ 50 MHz	6 K	16 K
Core Type	Ferrite	Ferrite
Input Connector	Polarized Bullet	Polarized Bullet
Output Connector	Polarized bullet	Polarized Bullet
Physical Size		

Why use Power and Control Line Isolators?

Stray RF is not confined just to coaxial feed lines and inadequate ground systems. Stray RF can appear on the power cables connecting your radio to its power supply. It can exist on the control lines that interconnect all of your equipment. This stray RF can arrive in several ways. It can be conducted on control cables and power leads. It can enter and exit via A.C. power lines to the radio room. It can also be induced by direct radiation from the antenna system itself. Up to this point, you've had ferrite beads, cores, and toroids to fight the RFI and RF feedback battle. Now, you have a new super-weapon - the *PCLI*. The *PCLI* is far more effective over a very wide frequency spectrum than beads, cores, and toroids alone. The *PCLI's* are the best insurance when control or power lines are suspect.

Important

You must use a mating cable to splice a PCLI into an existing cable. Alternately, remove connectors or order PCLIs without connectors and permanently solder the PCLI into the circuit.

PCLI's in Control Cables

There are three major sources conducting RF back into the radio room. One is the coaxial feedline. That problem is solved using the T-4, T-4-100 and T-5 series of Line Isolators. The second source is the control cables connecting control units in the radio room to remote tuners, rotators and remote antenna switches located away from the radio operating position. The wire and cable can act as antennas which bring radiated and conducted RF directly back into the radio room in interfere with equipment operation. The third problem is an inadequate RF ground system.

Remote Automatic Tuners

This can be an especially difficult problem when working automatic tuners against less than perfect ground systems. Lacking the very low impedance RF ground system, the automatic tuner "floats" at some RF voltage above ground and the entire control cable can have RF traveling along its length. This conducted RF must be removed before it reaches the radio operating position and this is what the *PCLI-4* is designed to do.

Mating Cables

See page 66 for more information on RFI and Sealing Kits.

2-Conductor, #10 AWG, use with PCLI-2

14 feet long with two mating bullet plugs. **$10.95**

4 feet long with mating bullet plugs. **$5.95**

4-Conductor, use with PCLI-4

One foot. Cut in two to make two mating cables for splicing into a 4-wire circuit. **$4.95**

HIGH PERFORMANCE WIRE ANTENNAS

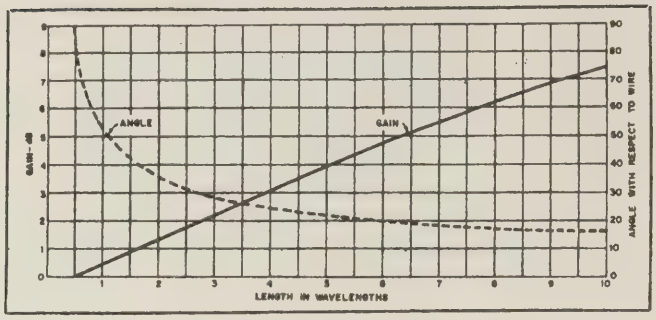


Figure 1
Gain verses antenna length

Figure 1 is a **treasure map.** Contained within this diagram is one of Mother Nature's important secrets. The mystery of wonderfully loud signals emanating from insignificantly looking antennas strung between two cooperative trees is explained in this simple chart. This map to the "Treasure Island" of incredible antenna performance was lifted from the 14th edition of the ARRL Antenna Book, page 7-1.

Popularity does not guarantee high antenna performance -

The all time favorite wire antenna is the half-wavelength dipole, center-fed with coax. Building it is easy, and it performs adequately. The dipole is the reference used to measure the performance of the other antennas. It is the base line. The dipole is a suitable reference for amateur radio purposes because you can actually build one. In contrast, all the antenna patterns used in this publication are referenced against an 'isotropic antenna.' The results are expressed in dBi.

Isotropic Antenna

An Isotropic Antenna is a hypothetical antenna radiating or receiving equally in all directions. Such antennas do not exist physically but represent convenient reference antennas for expressing directive properties of actual antennas.

One band just isn't enough - Most hams want to be operational on as many bands as possible. This requires a separate dipole for each band. Since we now have eight HF bands, that means that eight different coax-fed dipoles are required to cover all the bands from 80 through 10 meters. Eight separate antennas are unacceptable to the average Ham. **Most of us want 80 through 10 meters coverage with a single antenna.**

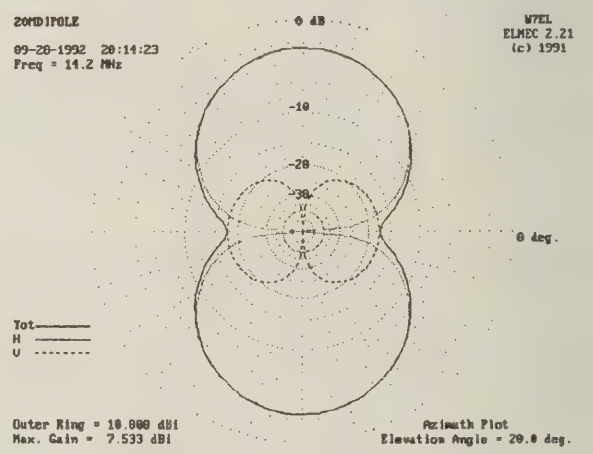


Figure 2
20 meter dipole @ 50'
takeoff angle = 20°

There are several ways to achieve this goal of a single antenna for 80 - 10 meters. The most popular technique for achieving multiband operation with a single antenna is to divide the antenna into appropriate lengths with 'traps.' Traps act like electronic switches, which isolate the correct portions of the antenna wire to achieve half-wavelength resonance within each desired band. A five-band trap antenna can use as few as two traps or as many as eight. It all depends the trap design and the desired SWR performance of the antenna. In general, the more traps, the better behaved the antenna is in terms of operating bandwidth and acceptable SWR.

The RADIO WORKS Box 6159 Portsmouth, VA 23703 (757) 484-0140

More High Performance Wire Antennas

There is a high price to pay for the convenience of traps. First, trap antennas are usually expensive. Second, there is a loss of operating bandwidth if a low SWR is a requirement. Besides the bandwidth loss, there may be a slight loss in efficiency caused by the traps themselves. This loss may not be significant if the traps are well designed.

Disadvantages of trap antennas

1. Dipole performance at best
2. Trap antennas often require trimming
3. Traps fail
4. High cost of traps
5. Hard to troubleshoot
6. Detuning effects of nearby objects
7. They are heavy and often difficult to support

Advantages

1. No tuner required, if you are willing to operate within narrow portions of the bands.
2. Slightly shorter than full size dipoles
3. One antenna can cover many bands

It is my argument that **trap antennas are not an efficient use of available antenna space.** If you put up a 120' long 80 - 10 meter trap antenna, why use only 33' of it on 20 meters? There are significant advantages to using the full antenna length on all bands. Let me show you some interesting data.

Figure 3 is the radiation pattern of and 'Extended Double Zepp' or 'EDZ.' An EDZ built for 20 meters is about 85' long. Notice the difference in the pattern of this antenna and the curve for the dipole in figure 2. The narrowing of the lobes concentrates the energy radiated by the antenna. Concentrating energy is another way of saying the antenna develops gain. **The Extended Double-Zepp produces between two and three dB gain.** A 3 dB gain is the equivalent of doubling your output power. Note the four 'minor lobes.' Operation is not limited to the direction of the major lobes.

The point of comparing these two curves is to show that it is possible to build better antennas than dipoles.

This is not the end to the story. In fact, let's go back to the beginning. Figure 1 gives us the most important reason for using the full length of 80 or 40 meter antennas on higher bands where antenna length becomes long.

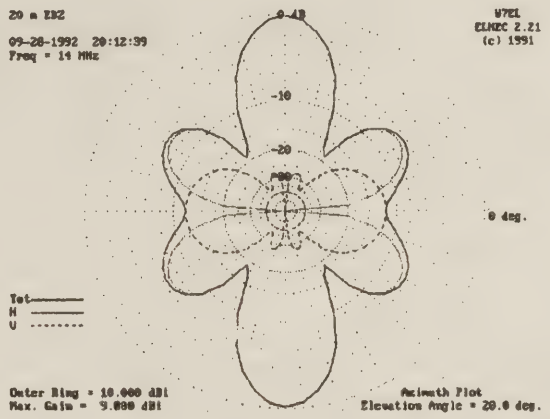


Figure 3
Extended Double Zepp @ 50'
Takeoff angle = 15°

Notice the curve, marked "gain." It rises as the length of the antenna increases beyond ½ wavelength. These gain figures are not large. For example, on 10 meters, the gain of an 80 meter dipole will be only 3 dB. But, that's three dB you wouldn't have if you were using a dipole. It is the same as doubling your power. Remember that every dB counts. **3 dB here, another 3 dB, they add up to a big signal.** Figure 1 proves a very important point. Put up a lot of wire, and get a lot of gain. It's that simple.

Combine the advantage of a long antenna with techniques that lower the radiation angle, and the result is unbeatable. This is the secret of high performance wire antennas. It's not magic, it just taking advantage of physical laws.

The RADIO WORKS specializes in high performance wire antennas that take advantage of these principles. Take a close look at the CAROLINA WINDOM series of antennas, CAROLINA BEAMs, SuperLoops, and G5RV Plus.

The CAROLINA WINDOM

What People Are Saying

Here is what the magazine product reviewers have to say about the CAROLINA WINDOM.

WorldRadio Product Review

"...Parts quality is very high. Jim manufactures his own baluns and line isolators at his plant.
....This antenna is an outstanding example of engineering and research put into practice. .....Received signal strength on the (CAROLINA) Windom was one to two S-Units higher than on the G5RV (the reference antenna, made by another manufacturer). Over the next several days, all bands were tried with similar results. In most instances, the CAROLINA WINDOM seemed to yield better receiver signal levels and more reliable communications out past 400 miles than my G5RV (the test rig was an Argonaut 509 operating at 2 watts output). I attribute this to the vertical and horizontal radiation patterns produced by the antenna system.

Going on the assumption that a 1-2 S-Unit increase in receiver signal level should yield a similar increase in transmitted signal, I feel that the CAROLINA WINDOM is a superior antenna to my G5RV dipole."

These are excerpts from a product review by Rich Arland, K7YHA. It appeared in the July 1988 issue of WorldRadio.

Since the CAROLINA WINDOM first entered the market place nearly 12 years ago, there have been 6 product reviews of various models of the CAROLINA WINDOM. I will reprint product reviews excerpts and letters from CAROLINA WINDOM users in future catalogs. If you would like to do a little bragging in print, just drop me a letter. You don't have to set records, just let us know what you think of our antenna products

Bill Clarke in 73 Magazine

In his September, 1991 review of the CAROLINA BEAM, Bill Clarke compares the CAROLINA BEAM with a CAROLINA 160 and 80 and 40 meter dipoles.

He starts off his article with **"It's easy to set up, and it works great!"** Here are a few excerpts from his article.

" ..... The Carolina Beam is about as simple to install as any antenna I have seen to date. ..... My time was 20 minutes from 'out of the package' to 'on the air.'
..... My first observation was that the CAROLINA BEAM hears as well as it talks. When a received signal was better on the CAROLINA BEAM, the outgoing signal was better than that from the dipole or the (CAROLINA WINDOM 160).

- 80 meters: As good in all cases, and about 10 dB better than the (CAROLINA WINDOM 160) for local work.
- 40 meters: Same as the dipole and same as the (CW 160).
- 30 meters: Same as the CW 160 90% of my contacts. Remainder slightly better.
- 20 meters: 50:50, with no clear winner. This is probably due to the distinct pattern differences between the (CW 160) and the CAROLINA BEAM. Having both to select from made a real difference in making DX contacts.
- 17 meters: In all cases, the CAROLINA BEAM outperformed the (CW 160) by 5 dB or better .....
- 15 meters: As with 20 meters, this band was quite variable.
- 12 meters: A distinct low-angle worker. The CAROLINA BEAM always outperformed the (CW 160) by at least 5 dB.
- 10 meters: Same as 12 meters."

In this test the CW 160 (which is 265 feet long) was supported 48 feet in the air. The CAROLINA BEAM is 100' long and was supported at 40 feet. The fact that the CAROLINA BEAM was as good or better than the much larger CW 160 is extraordinary. And, the CAROLINA WINDOM 160 is well known for its exceptional performance on all bands.

Can the Carolina WINDOM be the best performing, simplest, easiest to put up, wire antenna? I think so, and so do some of these CAROLINA WINDOM users who wrote to us.

Writing from Hawaii, Hal writes: "I'm writing to let you know that you have another satisfied customer... The antenna (CW 80) was only about 30 feet up at the feed point ... however, the antenna worked remarkably well." In making comparisons to a nearby ham with a A4S with 40 meter capability, "the owner of the A4S would consistently get better signal reports on his end, however if the DX station was more than 3000 miles away, I would hear the station better." " There was one time, Mark could not hear the station at all, and I had them S7-9." "I was transferred to Diego Garcia (VQ9) in March, and was looking forward to getting on the air here." "I ordered the CAROLINA WINDOM/2 (now the CAROLINA WINDOM 40)." " I have operated 2 ½ hours in three days since installing the antenna. It does help that DVQ9 is fairly popular, but I have made over 200 contacts. 200 contacts in 2 ½ hours. Japan, Russia, Netherlands, Johannesburg, Tromelin, China, Finland, West Malaysia, Singapore, (and the list goes) on. UNBELIEVABLE. All this using a Drake t4XC/R4C and 70 - 90 watts output. Who am I? I am just a Radioman Chief Petty Officer, 18 years in the U.S. Navy who communicates HF on a daily basis for a living, then goes home and does it for fun. I do not impress easily. You have one hell of an antenna!"

During first week of operation I worked the following on 75/80 meters using only 300 watts PEP, with the antenna at 30 feet: HP1, Y22, HR1, F6, A92, YU, ON, EI, YT, G, PA, DJ, CM, KP, VP, SP, IK. (K5SFM)

On 75 meters it works great, as I had expected it to work. My surprise came on 20 meters. ...I worked numerous DX stations and most were surprised at the signal with only 100 watts. I am very pleased with the antenna -Thanks. (WA6HXE)

"Just a note to tell you how pleased I am with my CAROLINA WINDOM. It works great. I am 78 and was licensed at age 17 and it is the best long wire I have ever used. 73, W1GAY

I would and do recommend the CAROLINA WINDOM to everyone I've talked to on the bands....The 2 Hams that helped (put it up) will also buy-they are impressed. (KA4SSH)

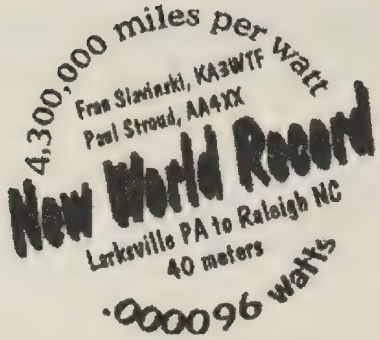
Got the (SuperLoop 80) up about 2 weeks ago. I am sure you have received many good comments on this one. Add my unsolicited testimonial. In 53 years of active hamming, this is the best all band antenna I have ever used. This includes my Double Extended Zepp with homemade 600 ohm open wire feed line that was 80 feet high. Thank you for all the hard work that went into the SuperLoop 80. 73, Jack, K4MI

When band conditions are poor, and 40 and 80 meters are the only bands open at night, it's easy to have a competitive signal on the air. Practically everyone is using a simple dipole. In comparison, a high performance antenna like the CAROLINA WINDOM stands out like a shining beacon. But the bands will be getting better over the next couple of years and you will have to compete with stations using beams. I have pulled some letters out of the file that came in during the last sunspot high when conditions were good and competition for DX was at its greatest. Even under the competitive conditions, the CAROLINA WINDOM is an even bigger winner.

Writing about a CW 160, George, AD1S/V73S writes: "My first contact was with YS1RRD - second call on SSB - didn't have time for the linear to warm up so worked him with 100 watts. - he said my "actual signal report in San Salvador was 10 dB over S9!"

Good quality, good performance to date (KB2EVV)

..Works very well...good buy for the money (J.Stacey)



A New World Record

For the SECOND TIME -

The CAROLINA WINDOM 40 was there!

They've done it again! Congratulations Fran and Paul. A new 40 meter record, using only 96 microwatts into a two element V-beam on the transmit and and once again the incredible CAROLINA WINDOM 40 at the receiver end.

The CAROLINA WINDOM 40 was used on the receiving end to dig this record breaking 96 microwatt (.000096 watts) signal out of the 40 meter QRN and QRM. Here are the highlights of the World Record breaking achievement. Remember, this is the second time they have broken the mile-per-watt record on 40 meters. Their first record was accomplished with 221 microwatts. The second record was logged using only 96 microwatts over the path from Paul's QTH is in the North Carolina Woods, 16 miles south of Raleigh. Fran was using a CAROLINA WINDOM 40 up about 30 feet and Paul was transmitting with a two-element V-beam. Contact was established using microwatt power as these operators avoided the conventional practice to making contact QRO, and then reducing power until the signal is lost. They did it the hard way!

In the original record setting operation, Rich Arland, K7YHA was also listening for Paul's 221 micowatt signal. Rich is an avid QRP operator, columnist and writer. Rich adds this interesting note, "A comparison between signal reports received at Fran's QTH with my S-meter readings definitely points to the outstanding performance of the CAROLINA WINDOM/2 versus a standard 40 meter dipole."

In my opinion, dollar for dollar, in over 20 years of both military and amateur experience, this is the best simple wire antenna. Wide band coverage, low SWR, low QRM, omnidirectional and low cost; as the saying goes "Who could ask for anything more?" (KD4RFW)

It's not often that you can buy a product and get what you pay for, however, in the case of the "CAROLINA WINDOM" you can and then some. ...the results were unbelievable, there was at least 10 dB difference between the V, dipole and the (CAROLINA) WINDOM. I had people drive 200 + miles just to see if I did indeed have up 3 antennas, I even put the Windom up where the dipole was and vise-versa with the same results...I saw people standing in line to buy them at the Charlotte Hamfest. (N4RQZ)

Thanks again, Jim, for a well made product that performs better than your claims. (N1EJF)

"I just worked BY4RB in Peeking, China. The story is interesting. I worked him using my new (rig) and triband beam on 15 CW. My RST was 569. My friend Jerry, N4JF, was visiting. We switched ops so he could work BY4RB. I switched to the CAROLINA WINDOM/2. Jerry worked BY4RB on the first call! RST 559! What an antenna. This thing is unreal! (Dave Ingram, K4TJW, columnist and writer of several Ham Radio publications)

Quality and performance are impressive. I replaced a G5RV with the CAROLINA WINDOM in the identical location. .... My initial findings are that the CAROLINA WINDOM is at least 1 S-unit better than the G5RV. (Geno McGahey, AL7GQ)

Writing about the CAROLINA WINDOM/2, "My wife and I believe it is the best wire antenna we have ever used..... (Bill Welsh, W6DDB. CQ columnist)

What Makes The CAROLINA WINDOM Work So Well?

1. At hamfests, I spend a lot of time talking about antennas. The number one topic is "What makes the CAROLINA WINDOM WORK?" Here is the story in a nutshell.

The magic of the CAROLINA WINDOM is its 'Vertical Radiator.' When the vertical radiator is removed, the antenna still operates, but not surprisingly, the radiation patterns are just about the same as they are for any multiband antenna of the same length.

Presented at right are two radiation patterns. Each is a CAROLINA WINDOM 80 operating on 20 meters. In *Figure1*, the vertical radiator has been removed. In *Figure 2*, the vertical radiator is operating. What an amazing difference the Vertical Radiator makes. As you can see in *Figure 1*, when the vertical radiator is absent, radiation at low takeoff angles diminishes as the radiation pattern approaches the horizon. On the other hand, in the pattern where the Vertical Radiator is operating, radiation from the antenna continuously increases up to a point less than 5 degrees above the horizon. This is where "ground-effects" prevent a zero-degree takeoff angle. This is a significant radiation pattern improvement at the important very low takeoff angles.

Figure 1
CAROLINA WINDOM 80
Operating on 20 meters, with no Vertical Radiator

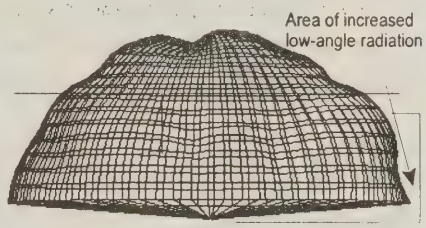


Figure 2
CAROLINA WINDOM 80
Operating on 20 meters.
Normal operation with Vertical Radiator in place.

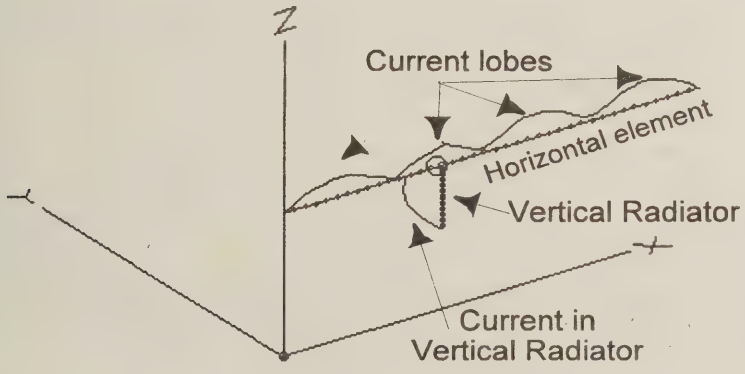


Figure 3
Current distribution of the antenna is shown in *Figure 2*.
It is the high current in the Vertical Radiator which causes the radiation pattern to change as it does from *Figure 1* to *Figure 2*.

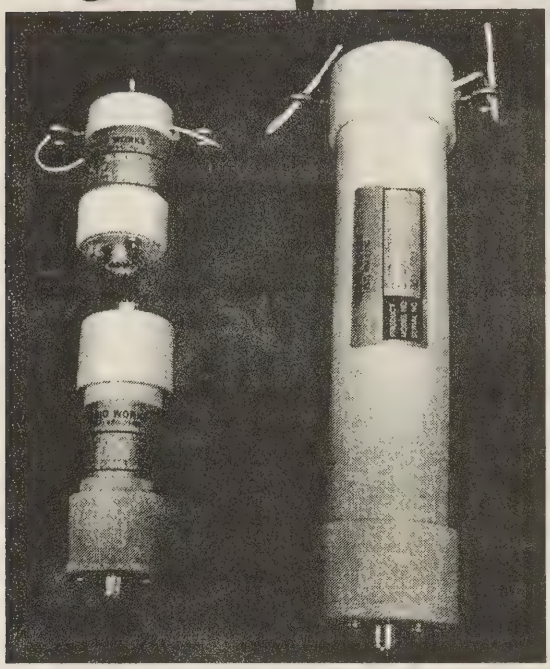
Important

I have new antenna modeling software in hand and will put representative radiation patterns for the various antennas on our web site as they are developed.

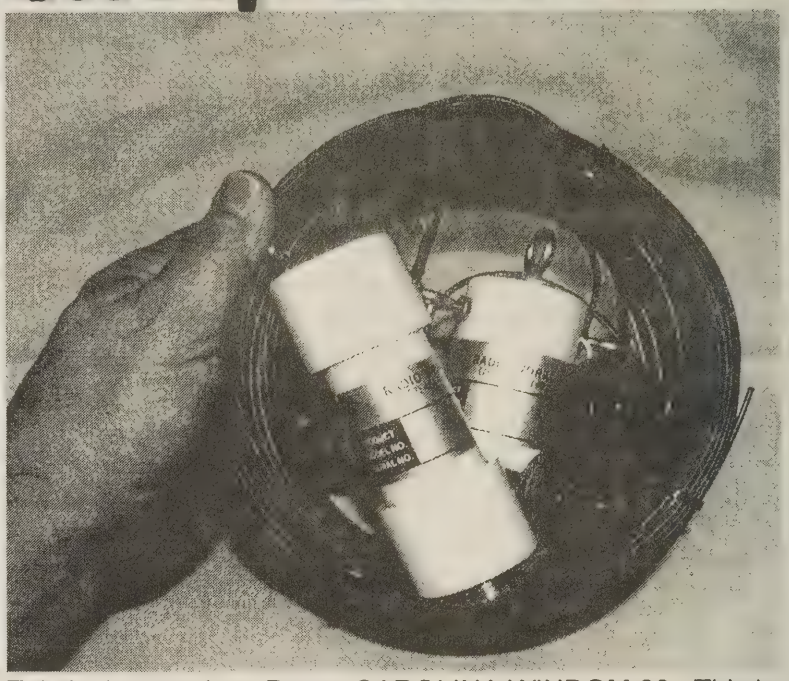
The Vertical Radiator is an inverted vertical antenna. Its counterpoise is the flattop portion of the antenna. Both the horizontal and vertical elements of the CAROLINA WINDOM combine to form an antenna system which produces an exceptional radiation pattern. Radiated energy is concentrated at low to moderate takeoff angles. Such a pattern is not possible with conventional horizontal wire antennas.

The difference in low-angle radiation is very significant. It accounts for the one or two S-units improvement over dipoles reported by CAROLINA WINDOM users.

New, Smaller, Better



Shown here are the new Matching Transformer and Line Isolator compared to the standard matching transformer.



This is the new Low Power CAROLINA WINDOM 80. This is the complete assembly, matching transformer, Line Isolator, Vertical Radiator, #18 insulated copper-clad steel antenna wire, and end insulators..

We've needed smaller Line Isolators[tm] and baluns for some time. Until just a few months ago, it wasn't possible to build the smaller baluns and Line Isolators[tm] without accepting compromises in performance. Fortunately, new ferrite types became available, and we are able to combine the new ferrites with new winding and assembly techniques to produce a special series of small baluns and Line Isolators[tm] and matching transformers that are the equal of their big brothers. In fact, in some cases, except for the power rating, the specifications are better than the originals.

One exciting thing is that this opens up a completely new arena of products never before possible. You will see in this catalog, many CAROLINA WINDOM models offered in a new configuration that has far less visual impact due to the small size of the Matching Transformer and Line Isolator[tm]. This solves the problem of stealth that's necessary for those who have to keep their antennas as invisible as possible. The new, smaller versions also lend themselves to portable and emergency operation. With our new 33-foot telescopic mast, you can have a high efficiency emergency or field day antenna in the air in just minutes.

As you can see from the photograph, you can now hold a complete CAROLINA WINDOM 80 in just one hand. Now, you can be ready for anything. And, did I mention that these antennas could handle up to 200 watts of SSB or CW in the ham bands? I was aiming at 100 watts but the design is so good power rating could be doubled. That's because the components used are top quality. What that means is that in most instances, the smaller baluns and Line Isolators[tm] cost more to build than the larger versions. This is why you see little difference in price between the various versions. It had to be that way because we simply wouldn't compromise efficiency, bandwidth, and other critical characteristics. The only thing that has changed is the size.

QRP
Stealth
Portable
Emergency
DX'peditons

New! CAROLINA WINDOMS

"Low Power" QRP to 200 watts versions

All of the performance - smaller size & less weight

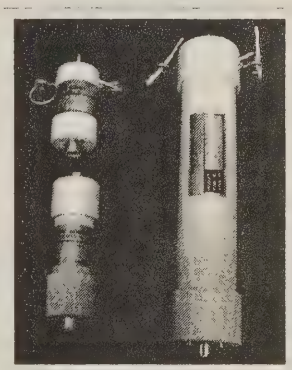
In response to popular request, I'm proud to announce the latest in our continuing development of CAROLINA WINDOM technology. We've been able to reduce the size of the matching transformer and Line Isolator without any compromise in performance. The result is a lean, mean DX-machine for those occasions when a portable or stealthy, but very high performance antenna is needed.

Specifications

All electrical and physical specifications except those listed in the "Type" listings are identical to those of the standard CAROLINA WINDOMS.

Important - a transmatch (tuner) is still required as with standard CAROLINA WINDOMS.

The New Low Power CAROLINA WINDOM's radiation patterns are identical to the standard CAROLINA WINDOMS. This means you get all of the incredible performance for which the antenna is famous. The only thing you lose is the size and weight. *Of course, if you choose the version made with #18 insulated wire, it is not nearly as strong as the versions made with #14 wire.* For permanent installations, the #14 is recommended. However, for stealthy hidden antennas, portable, emergency, DX'pedition operation and similar applications, the #18 wire version of the CAROLINA WINDOM antenna with the new smaller transformers is the ideal choice. The #18 wire is nearly invisible at a distance. The matching transformer and Line Isolators are one-fourth the size of the standard units. The combination of small physical size and low weight, combined with CAROLINA WINDOM performance, simply can't be beat.



On the left are a new, low power matching transformer and Line Isolator, compared to a standard unit on the right. The only compromise is the lower power rating. Otherwise, it's full CAROLINA WINDOM performance.

Standard Type - This is the conventional CAROLINA WINDOM made with **full-size components, #14** hard-drawn stranded antenna wire and a 1.5 kW power rating. For permanent installations.

Type LP-14 - Uses new reduced-size components, but retains the #14 hard-drawn wire for permanent installations. Power rating is 200 watts max.

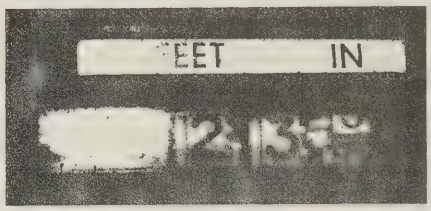
Type LP-18 - Uses new reduced-size components, but retains the #18 copper-clad, insulated wire for portable and stealth installations. 200 watts max.

Available "Low Power" Models

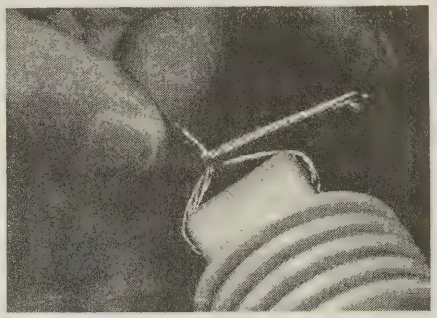
CAROLINA WINDOM 80 Type LP-14 or LP-18
CAROLINA WINDOM 40 Type LP-14 or LP-18
CAROLINA WINDOM 40 Performance Plus™ Type LP-14 or LP-18
Short CAROLINA WINDOM 40 Type LP-14 or LP-18
Short CAROLINA WINDOM 80 Type LP-14 or LP-18
CAROLINA WINDOM 620 Type LP-14 or LP-18

See the individual description pages for prices

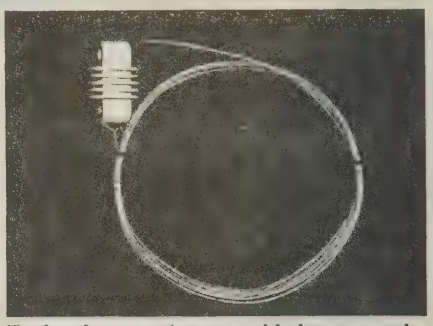
Building A RADIO WORKS Antenna - No One Does It Better!



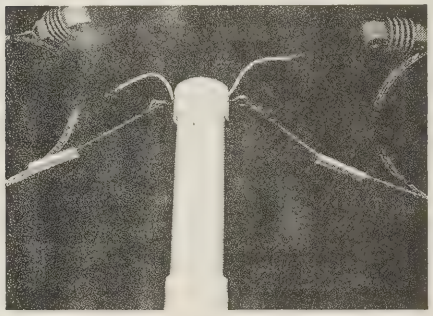
Each antenna is designed using only the best parts. Each element is precisely measured. This element of a 20 meter CAROLINA WINDOM measures 23' 5.5". This same precision goes into each part of the antenna system. Close-enough just isn't in our vocabulary. It's either right on or it's not a RADIO WORKS antenna.



Even the insulator are instilled with measured precision.

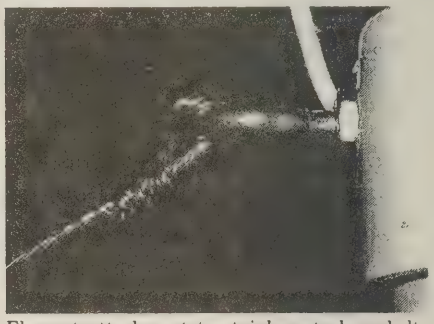


Each element is assembled separately. Once a run is complete, further assembly proceeds. This prevents errors and insures that we meet our specifications.

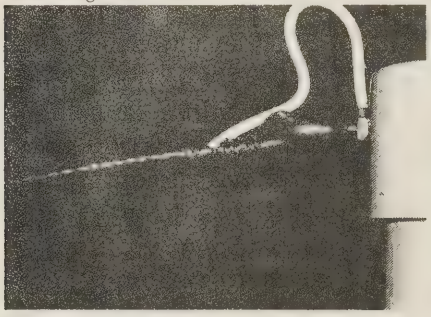


After all subassemblies are completed, the final assembly begins. Wire ends are carefully measured and attached to the matching unit.

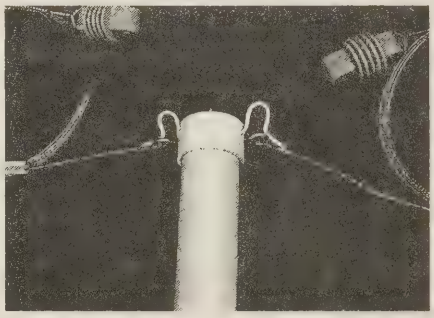
Each twist is tight and perpendicular to wire element to add strength. Eye-bolts are stainless-steel.



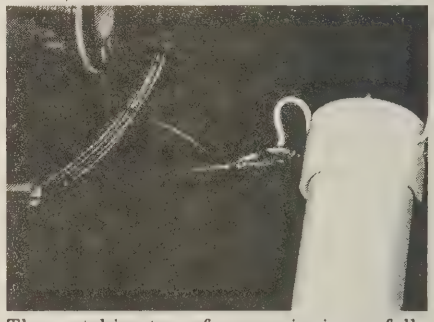
Element attachment to stainless-steel eye-bolts provides strain relief only. Eye-bolts are electrically isolated to eliminate any receiver noise generated by rubbing of dissimilar metals.



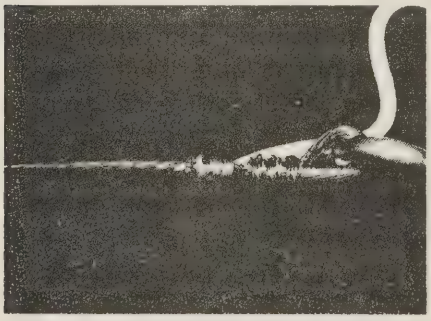
Matching transformer wires exit the case and are attached to the wire element. This eliminates any chance of poor a connection.



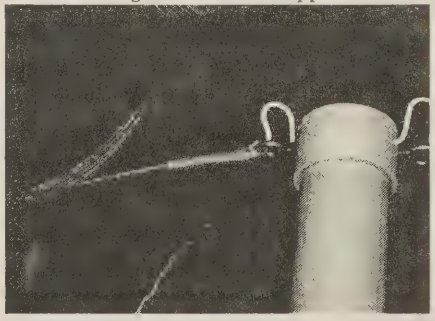
Both elements are prepared and carefully inspected before soldering begins. All excess wire is cut away to protect heat shrink tubing which will be applied later.



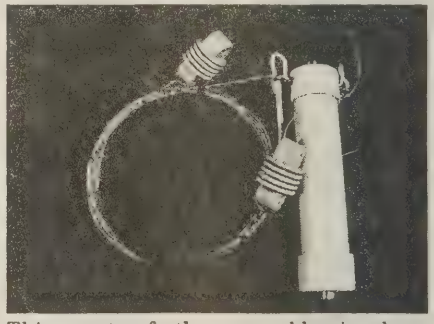
The matching transformer wire is carefully soldered to the antenna wire element with controlled heat to prevent weakening the wire element.



Only the matching transformer wire is soldered. This further prevents wire weakening due to overheating of the wire. Note the shinny, perfectly soldered joint.



The previously installed heat-shrink tubing is pushed into place to cover the soldered connection. Heat is applied. This is just one more example of the extra care we build into each of our antennas.



This part of the assembly is done. Depending on the antenna type, other assemblies are made ready. The final step is packing the antenna with manuals and Coax-Seal for weatherproofing.

Do's and Do Not's of Antenna Installation

Do's

Inspect coaxial cable for flaws in its jacket. Don't be concerned about minor jacket irregularities.

Pay particular attention to station grounding. This is especially critical when your station is not on the ground floor.

In most cases, it is OK to bury standard coax. You can add some protection by running it inside standard garden hose. Bury coax below the frost line.

Carefully seal any coaxial connector exposed to weather. Follow the procedure outlined in this publication.

Check available space before purchasing an antenna. Make sure the antenna will fit. Reasonable bending of the elements will not hurt. Elements must never be bent back on themselves. If space is limited, consider alternatives.

To avoid kinks in antenna wire, roll it out hand-over-hand.

Antennas will work in trees. In most cases, it doesn't hurt if the wire touches leaves, though you might set a leaf or two on fire. If you want, consider using insulated wire.

Definitely use Dacron™ antenna support line. Nylon, Polypropylene, Hemp, Cotton, or other rope types are not suitable in this application. Use Kevlar™ only if you don't want any stretch in support lines, however some stretch is desirable.

Install your antenna as far away as possible from your or your neighbor's house. Antennas close to houses are great candidates for RFI and TVI problems.

Do Not's

Do not change the length of manufactured antennas. Antenna lengths are critical.

Do not roll up the ladder line in G5RVs or SuperLoops.

Do not bury Ladder Line or let it get close to the ground or anything metal. Do not run it along side other cables. It must be in the clear.

Do not rely too much on inexpensive antenna analyzers. You can't be sure what parameter you're actually measuring.

Do not support a CAROLINA WINDOM so that its Vertical Radiator is closer than 15' minimum to a tower or other metal object. If less than 15', direct it away from the metal pole or tower at an angle.

Do not tie down the Vertical Radiator of a CAROLINA WINDOM. It must move with the antenna, or the connectors will pull apart. However, don't let the Vertical Radiator swing around enough to hit something. The weight of the coax and Line Isolator is usually enough to keep the Vertical Radiator in place.

Don't lay the CAROLINA WINDOM's Vertical Radiator on your roof or cut a hole in the roof to keep it straight. (This has been done!).

Don't use heavy weights in combination with pulleys to hold an antenna taut. Free falling weights accelerate the antenna like a bow string. The wire fails.

Don't worry about coax losses. When the SWR is below 5:1 or so, you can't measure the loss in signal strength. Use a tuner to make your rig happy when the SWR is high.

CAROLINA WINDOM 80

Earned its reputation honestly, one QSO at a time™.

Length	Height	Bands Covered				
133'	35'		40	20	15	10
		80	30	17	12	

All Bands 80 - 10 meters + WARC

- ♥ Outstanding on all bands covered
- ♥ Great WARC band performance
- ♥ An antenna that does it all
- ♥ Unusually low angle radiation pattern
- ♥ Easily beats G5RV, dipoles, trap antennas
- ♥ Special Matching Transformer
- ♥ Enhanced, low angle, Vertical Radiator
- ♥ High efficiency - no ground losses
- ♥ Ground independent - radials not needed
- ♥ The secret is the inverted VERTICAL RADIATOR
- ♥ Matching Unit enhances vertical radiation
- ♥ Use Transmatch
- ♥ ***Chosen by 'Big Gun' DX'ers and DXpeditions.***

The CAROLINA WINDOM has been the performance choice of 'Big Gun' DX'ers and DX'peditions. You've heard the CAROLINA WINDOM from Navassa, Sable Island and Albania among many other DX'peditions. Why not take advantage of their big signal secret with the CAROLINA WINDOM? This antenna can give you an S-unit or two advantage. You can't buy so much added performance for so little money anywhere else!

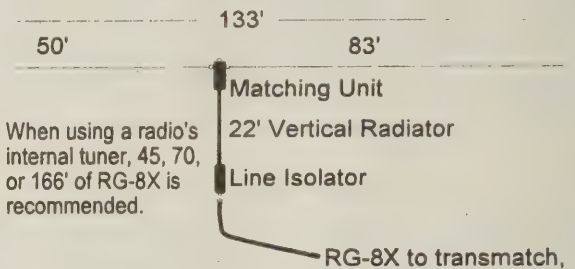
The CAROLINA WINDOM was the first antenna to take advantage of 'VERT™' (Vertically Enhanced Radiation Technique). 'VERT™' is a radiating feed line technique that produces a controlled, low angle vertical radiation pattern. The effect is absent from most ordinary antennas. Field tests, user reports and seven product reviews confirm that the CAROLINA WINDOM will give you a remarkable performance advantage.

The off-center fed CAROLINA WINDOM provides unusually good performance on all bands covered, including the WARC bands. It's an ideal antenna for those of you who do not wish to use a tower and beam. The CAROLINA WINDOM is also ideal for those of you who want a high performance antenna to cover the bands not covered by your beam antenna.

The Secret

It's the Vertical Radiator. Combined with the Dedicated Matching Unit and special Line Isolator, it is responsible for the low-angle, vertical radiation pattern.

CAROLINA WINDOM



SPECIFICATIONS

Freq. coverage:	80 - 10 meters + WARC
Gain:	As much as 10 dBd*
Radiator length:	Horizontal = 133' + Vertical = 22'
Polarization:	Both vertical and horizontal components
Feed line:	50 ohm Coaxial cable
Matching method:	Dedicated Matching Transformer + your transmatch
Tuner needed:	Yes
Power Rating:	1500 Watts, CW/SSB ◇
Recommended Ht:	>35' but usable at 30'
Radials?	Not required

* Based on user reports, field evaluations, and product reviews. Gain is due primarily to the low angle radiation pattern.

◇ **CW/SSB duty-cycles only. Not rated for AM, RTTY, PSK-31 or other high duty-cycle modes.**

GENERAL MOUNTING REQUIREMENTS

Mounting height at top of vertical section: >30'
Absolute minimum angle between legs = 126-degrees
Recommended min. angle between legs = 140-degrees
Minimum height at ends = 8'

GROUND SPACE NEEDED

Configuration v. Length needed

Flat top:	134'
Inverted-V @ 40' height:	120'
Inverted-U @ >30' height:	Length = 114'
Inverted-U bends:	10' short leg; 15' long leg
Slope @ 40' =	128' (not recommended)
Slope @ 60' =	121'

Recommended mounting configuration

Flat-top, suspended between two tall supports >140' apart.

List $125 Catalog **$95**

AUTO-TUNER Range Extender

MFJ-914 1.8 - 30 MHz, 300 watts. Many auto-tuners do not have the tuning range to match a CAROLINA WINDOM. The MFJ-914 solves the problem for only about $60.

Or, use the fantastic, new LDG automatic tuner.

Available in the new 200 watt versions

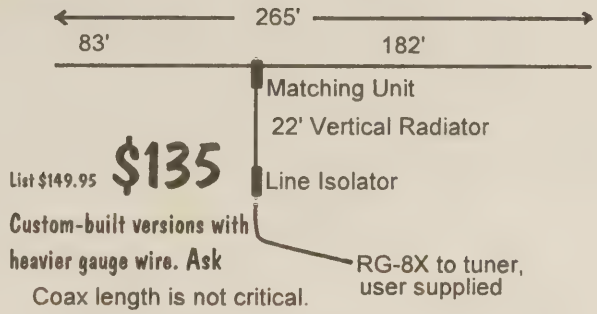
Introductory Price, LP-14 or LP-18 $85

Also, ask about our custom-built versions made with heavier-gauge wire.

CAROLINA WINDOM 160

Get no respect on 160? Try a 'CW 160'

Length	Height	Bands Covered				
265'	40'	160	40	20	15	10
		80	30	17	12	



It isn't easy to put out a respectable signal on 160 meters. It may be even harder on 80 meters because everyone has a strong signal. The CAROLINA WINDOM 160 comes to the rescue. The CAROLINA WINDOM is the antenna that has helped put many 160 and 80 meter stations on the map.

Go with a winner and break away from the pack. Put up your own CAROLINA 160. Then send out for a new supply of QSL cards.

Specifications

Frequency Coverage:	160 - 10 meters + 30, 17, 12 WARC
Gain:	As much as 10 dBd*
Radiator Length:	Horizontal 265' Vertical 22'
Feedline:	50 ohm coaxial cable
Tuner needed:	Yes
SWR:	Low, adjust with tuner
Power Rating:	Legal limit, CW/SSB ◊
Recommended Ht:	> 40' useable at 35'
Radials?	Not required

* Based on user reports and field evaluations. See explanations in "how it works" and various other sections of this reference catalog.

◊ CW/SSB duty-cycles only. Not rated for AM, RTTY and other high duty-cycle modes.

With 265 feet of wire, a Flat-top or Inverted-V are about the only support options available. On the low bands, the CAROLINA WINDOM 160's rivals are few, but you need a lot of room to put one up.

It will not hurt the antenna's efficiency if you bend the ends of the antenna slightly to make it fit into the space you have. Just keep the vertical radiator in the clear and the wire as high as possible.

The MFJ-914 "range extender" will permit using your transceiver's automatic tuner with this antenna.

Ground Space Needed

Configuration vs. Length Required

Flat Top:	265'
Inverted-V	240'
Inverted-U @ > 50'	Length = 256 - { 2 (height - 8') }
Sloper @ 40'	No major change in length requirements unless you have very tall supports.

General Mounting Requirements

† Mounting height of vertical section: >35'
† Absolute minimum angle between legs = 126°
† Idea minimum angle between legs = 140°
† Minimum height at ends = 8'

Recommended configuration

Flat-top, suspended between two tall trees located >265' apart or an Inverted-V supported by a tall center support.

Coax Length

Use any 50-ohm coax. RG-8X is recommended. Any length may be used in most installations. 70' or 166' work well with some automatic tuners.

Few of us have enough room for a full-size 160 antenna. Check out our CW 160 Special on page 53 for a terrific alternative.

The RADIO WORKS Box 6159, Portsmouth, VA 23703 (757) 484-0140

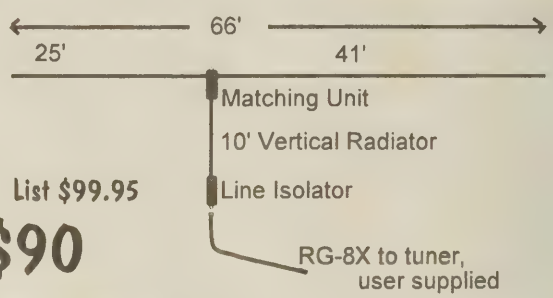
Available in the new, "200 watt" Version.

Used to set 2 world records

CAROLINA WINDOM 40

Unmatched performance on 40 - 10 meters

Length	Height	Bands Covered				
66'	30'		40	20	15	10
			30	17	12	



List $99.95

$90

Ask about custom-built versions with larger wire.

Specifications

Gain:	As much as 10 dBd*
Radiator Length:	Horizontal 66'
	Vertical 10'
Feedline:	50 ohm coaxial cable
Tuner needed:	Yes
Power Rating:	1500 watts, CW/SSB ◊

* Based on user reports and field evaluations.

◊ CW/SSB duty-cycles only. Not rated for AM, RTTY or other high duty-cycle modes.

2nd World Record - The CAROLINA WINDOM 40 was used in the 40 m "miles-per-watt" world record of over 4,000,000 miles-per-watt.

The CW 40 is a 66 foot multiband POWERHOUSE! DX stations all over the world use the CAROLINA WINDOM 40. It is DX'pedition proven and you get the same pileup breaking results. DX'er or casual operator, you can't put a better, simpler wire antenna system in the air. If it's results you want, choose the CAROLINA WINDOM.

The CAROLINA WINDOM's radiation pattern is different from simple dipoles and other similar antennas. Tests have shown that the *CAROLINA WINDOM 40* far out performs conventional antennas under similar conditions. Its unique combination of horizontal and vertical radiation components account for the exciting performance that outclasses its competitors. **The radiation pattern of the *CAROLINA WINDOM 40* is optimized for the upper bands.**

To give you an example of this antenna's capabilities, the very first contact I made with a *CAROLINA WINDOM 40* during testing was a CW QSO with 3W8CW in Viet Nam. That was a nice surprise!

Available in the new 200 watt versions

Introductory Price, LP-14 or LP-18 *$85*

Ground Space Needed

Configuration vs. Length Required

Flat Top:	66'
Inverted-V @ ≥25'	59' depends on height of end supports
Inverted-U @ ≥ 30'	Total 41' short leg bent 5'
	long leg bent 10'
Sloper @ 40'	58'
Sloper @ 60'	40'

General Mounting Requirements

† Mounting height of vertical section: >25'
† Absolute minimum angle between legs = 126°
† Ideal Minimum angle between legs = 140°
† Minimum height at ends = 8'

Recommended configuration

Flat-top, suspended between two tall trees located >70' apart.

Coax Length

RG-8X or other 50-ohm coaxial cable is recommended. Any length may be used in most installations. 86' is often a useful length when using an automatic tuner.

The RADIO WORKS Box 6159, Portsmouth, VA 23703 (757) 484-0140

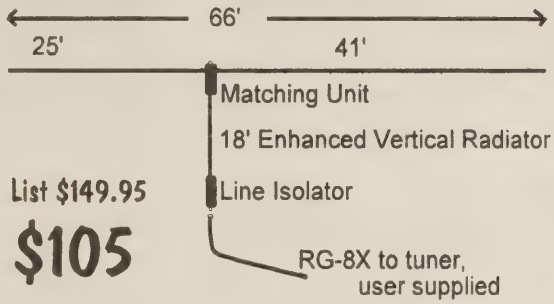
Available in the new, "200 watt" Version.

CAROLINA WINDOM 40 Performance Plus™

Unmatched performance on 40 - 10 meters

Length	Height	Bands Covered					Performance
66'	38'		40	20	15	10*	Excellent
			30	17	12		Compromise

* Though optimized for the lower bands, 10 meter operation remains excellent.



List $149.95

$105

Specifications

Gain:	As much as 10 dBd*
Radiator Length:	Horizontal 66'
	Vertical 10'
Feedline:	50 ohm coaxial cable
Tuner needed:	Yes
Power Rating:	1500 watts, CW/SSB ◊

* Based on user reports and field evaluations.

◊ CW/SSB duty-cycles only. Not rated for AM, RTTY, or other high duty-cycle modes.

Due to performance improvements, the CAROLINA WINDOM 40 Performance Plus cannot be reconfigured into a CAROLINA BEAM 40.

It's hard to imagine that it could be possible to improve the antenna which helped set two "miles-per-watt" world records. However, as with all things, you can always find a better way. That's just what has happened to the CAROLINA WINDOM 40.

The secret of a CAROLINA WINDOM antenna is its vertical radiator, which functions as both a matching stub and as an active element of the antennas. It is the vertical radiator that gives the CAROLINA WINDOM series of antennas their incredible performance advantage. The vertical radiator used with the CAROLINA WINDOM 40 was optimized for 10 meters and for the best matching compromise on all bands. Through computer modeling, it was determined that increasing the vertical radiator from 10 to 18-feet that an outstanding performance advantage over the original CAROLINA WINDOM 40 could be gained. There would be a slight compromise on 10 meters, but improvements on 40 and 20 meters is substantial. To accommodate the 18-foot Vertical Radiator, a new matching transformer and Line Isolator had to be developed.

Ground Space Needed

Configuration vs. Length Required

See CAROLINA WINDOM 40

Coax Length

Our RG-8X coaxial cable is recommended. Any length may be used in most installations. 86' is often a useful length when using an automatic tuner.

I have to say that in on-the-air tests, the results were beyond expectation. The big surprise was to find that the ***CW 40 Performance Plus*** nearly equaled the SuperLoop 80 on the 40 and 20 meter bands (taking patterns into account). The results were close under most conditions. Not bad for a 66' long antenna!

So, now you have a new choice. For maximum performance on 10- and 15 meters, choose the original CAROLINA WINDOM 40. If you want maximum performance on 40 through 15 meters, chose the ***CAROLINA WINDOM 40 Performance Plus***.

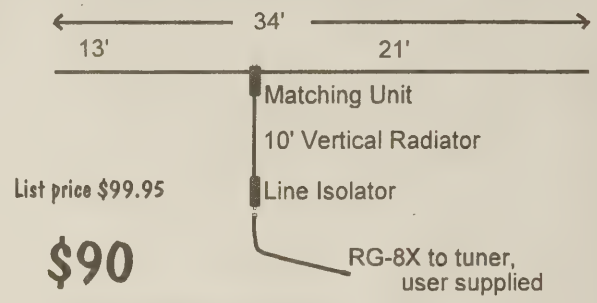
Available in 200 watt versions

Introductory Price, LP-14 or LP-18 $95

CAROLINA WINDOM 620

The easy path to Terrific performance on 20, 15, 10, & 6

Length	Height	Bands Covered					Performance
34'	30'			20	15	10	Excellent
				17	12	6	Compromise



List price $99.95

$90

Available in the new 200 watt version, PL-14 or PL-18 $85

Specifications

Frequency Coverage:	20, 15, 10 and 6 m 17 & 12 m with increased SWR
Gain:	As much as 10 dBd*
Radiator Length:	Horizontal 34' 6" Vertical 10'
Feedline:	50 ohm coaxial cable
Tuner needed:	Yes
Power Rating*	1500 watts, CW/SSB ◊ 500 watts on 6 meters
Recommended Ht:	> 30' useable at 25'
Radials?	Not required

The CAROLINA WINDOM 40 version of this antenna was used to set two world records on 40 meters. Imagine what you can do with the 20-10 meter version of the same antenna.

* Based on user reports and field evaluations. See explanations in "how it works" and various other sections of this reference catalog.

◊ CW/SSB duty-cycles only. Not rated for AM, RTTY or other high duty-cycle modes.

The CAROLINA WINDOM 620 has an ideal radiation pattern on 20 meters and above. The unusually low angle radiation pattern generated by the Vertical Radiator, in combination with the horizontal elements of the antenna, concentrates your signal at just the right takeoff angle for DX. If you can't put up one of our larger systems, the CAROLINA WINDOM 620 is the optimum choice. Forget about lossy, narrow band trap antennas. Forget about all the trouble with open wire and ladder line. Don't even think about using a G5RV. It'll do OK on 20, but on the other bands, it's less than exciting.

The CAROLINA WINDOM 620 uses the same principles and techniques as all of its bigger brothers. They all have the big punch it takes to get through when conditions are rough. If you can't put up a beam, then you definitely need a CAROLINA WINDOM.

General Mounting Requirements

† Mounting height of vertical section: >25'
† Absolute minimum angle between legs = 126°
† Idea minimum angle between legs = 140°
† Minimum height at ends = 8'

Recommended configuration

Flat top, suspended between two tall trees located >40' apart.

Recommended Coax and Coax Length

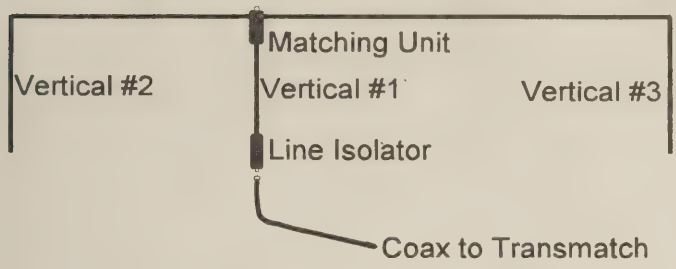
RG-8X is recommended due to its light weight and low stress on the antenna components. Any length may be used in most installations.

Available Now - and making a name for itself on the DX bands!

The RADIO WORKS (757) 484-0140

The "Short" Versions of the CAROLINA WINDOM

Formally known as the CAROLINA BEAM



Gain **Small Size**
Full Coverage **Low Cost**

The "Short" CAROLINA WINDOM™

The Short CAROLINA WINDOM™ is the antenna for everyone - DX, rag chewer, or net operator. You get full CAROLINA WINDOM performance on the lower bands and enhanced performance on the higher bands, and, all that in a shorter version of the antenna. There is no reason everyone shouldn't take advantage of their secret weapon.

The Short "CAROLINA WINDOM" combines the best characteristics of the CAROLINA WINDOM and the 'BOBTAIL CURTAIN' BEAM

The Short CAROLINA WINDOM™ is part CAROLINA WINDOM and part Bobtail Curtain (sometimes called a "Half-square"). It takes advantage of the best characteristics of both antennas. You have the performance advantages of the Bobtail Curtain, combined with the additional performance and convenience of the CAROLINA WINDOM. The Short CAROLINA WINDOM™ thus takes the lead in simple, high performance antenna systems. It sets the new standard for high performance, all band, wire antenna systems.

The Short CAROLINA WINDOM™ has three vertical radiators directly interconnected by the single horizontal radiator. It is this unique integration of horizontal and vertical radiation components that accounts for the outstanding performance of this antenna system.

A Shorter, Better Antenna

The major benefit of this system is the **short length** of the antenna. The 80-10 meter *Short CAROLINA WINDOM* is only 100 feet long. At only 100' in length, the Short CAROLINA WINDOM 80 is a full 33' shorter than an 80 meter dipole.

Combine the outstanding performance of the Short CAROLINA WINDOM™, its short length, all-band capabilities and convenient coax feed, and you have an unbeatable antenna, multiband antenna. It's the right antenna for both DX and general purpose operation.

PERFORMANCE

I compared the Short CAROLINA WINDOM 40™ (40-10 meters) and CAROLINA WINDOM 40™ against our reference G5RV system. During daylight operation when incoming signals arrive at high angles, all antennas perform similarly, with the G5RV coming in last. The Short CAROLINA WINDOM 40™ was down a bit from the CAROLINA WINDOM 40™ due to the Short CAROLINA WINDOM's extremely low takeoff radiation angle. However, at night, or anytime the band lengthens for long-haul DX, the Short CAROLINA WINDOM™ outperforms the G5RV by a couple of 'S-units,' sometimes more. Of course, the improvement depends on direction and distance. The CAROLINA WINDOM 40™ outperformed the G5RV nearly as well as the Short CAROLINA WINDOM 40™ until the bands really lengthened out and then the Short CAROLINA WINDOM 40 really moved to the front of the pack.

The Short CAROLINA WINDOM's performance and characteristics are similar to the full-size CAROLINA WINDOM. The shorter length is the result of folding the antenna to provide the two extra Vertical Radiators. The result is higher performance (depending on propagation).

The length of the Short CAROLINA WINDOM 80 is only 100 feet, or about the same size as the G5RV which falls way short in terms of performance.

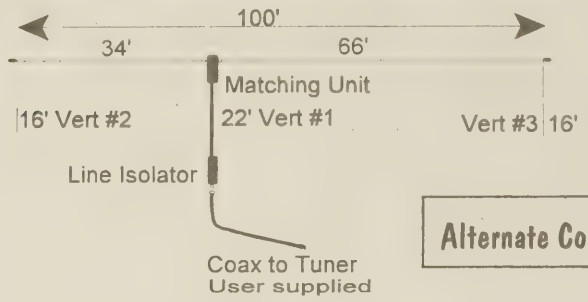
The phased multiple vertical radiator sections are the reason for the outstanding low-angle, long-haul performance of the Short CAROLINA WINDOM™. The three vertical sections generate a very low angle radiation pattern while radiation from the horizontal portions of the antenna provides a medium-to-high angle pattern.

The 10 Meter Surprise

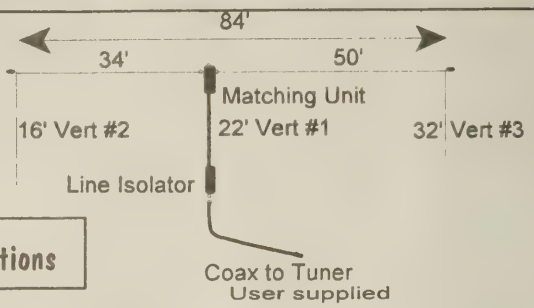
On 10 meters, incoming signals arrive at low angles most of the time. The advantage was always with the Short CAROLINA WINDOM™. The difference between the G5RV and the Short CAROLINA CAROLINA™ was the difference between hearing a station and not hearing it. It's like switching over to a Yagi. Signals seem to pop-up out of nowhere. The effect is almost more dramatic than the low-angle performance observed when long-haul DX is coming through on the other bands.

Reconfigurable CAROLINA WINDOM "Short" 80^{tm}

Formally - CAROLINA BEAM 80



Available in new 200 watt version



Alternate Configurations

Minimum height is 40'

We are continually improving our products, therefore, specifications are subject to change.

Length	Height	Bands Covered				
100'	30'		40	20	15	10
		80	30	17	12	

Short CAROLINA WINDOM 80^{tm}

The *"Short" CAROLINA WINDOM 80^{tm}* is **optimized** for 40 and 20 meters, but you do not give up efficiency on the other bands. For long-haul operation the *"Short" CAROLINA WINDOM 80^{tm}* is in a **class by itself**. When the band gets hot, you get hotter - no more standing in line waiting your turn. You work the station first, then just sit back, relax and let the other guys fight it out on frequency.

You don't have to give up casual operating, just because the *"Short" CAROLINA WINDOM 80^{tm}* is a **DX antenna**. But, non-DX'ers need a big signal, too. Besides, the *"Short" CAROLINA WINDOM 80^{tm}* is **field reconfigurable.** You can select just the right combination of medium-angle and low-angle patterns. **You can have a signal that demands respect.** It's the perfect, high performance, antenna choice for the DX'er, traffic-handler, rag-chewer, or dedicated SWL.

The *"Short" CAROLINA WINDOM 80^{tm}* **requires far less space** than other 80 meter antennas. All you need is 90 -100+ feet between supports and 30 or more feet of height, to be on the air with an outstanding signal. When the band opens, you will be ready!

Don't forget that the *"Short" CAROLINA WINDOM 80^{tm}* covers the WARC bands.

SPECIFICATIONS

Freq. coverage:	80 - 10 meters
Radiator length:	Horizontal 84' or 100'
Verticals:	16', 22' plus 16' or 32'
Polarization:	Both vertical and horizontal
Feed line:	50 ohm Coaxial cable
Tuner needed:	Yes, on all bands
Power Rating:	1500 Watts, CW/SSB*
Recommended Ht:	>40'- Usable at 30'
Radials?	Not required

** CW/SSB duty-cycles only. Not rated for AM, RTTY or other high duty-cycle modes.*

CONFIGURATIONS

All "Short" CAROLINA WINDOM Models

FLATTOP This is the design configuration for a *"Short" CAROLINA WINDOM 80^{tm}* or as it used to be called, a CAROLINA BEAM. You need two supports (trees, etc.) separated by the appropriate distance. Be sure to keep the vertical elements away from metallic objects.

INVERTED-V You may install your *"Short" CAROLINA WINDOM 80^{tm}* as an Inverted-V, but the angle must not be too sharp. 120 degrees is the acceptable minimum.

SLOPER There is no problem if one end of the "Short" CAROLINA WINDOM is higher than the other.

List Price $129.95

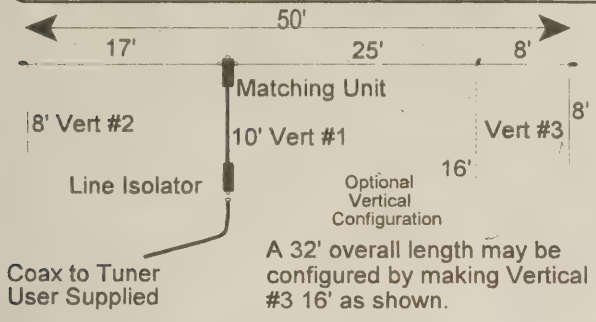
Catalog Price $115

Available in either LP-14 or LP-18, 200 W versions - $105.

The RADIO WORKS
Box 6159 Portsmouth, VA 23703 (757) 484-0140

Reconfigurable CAROLINA WINDOM "Short" 40™

Work the world with only 50' of space!



We are continually improving our products, therefore, specifications are subject to change.

Length	Height	Bands Covered				
66'	30'		40	20	15	10
			30	17	12	

HOW IT WORKS

The reason for the CAROLINA WINDOM's exceptional performance is its 'Vertical Radiator Section.' The *"Short" CAROLINA WINDOM 40* has three vertical radiators properly spaced to produce low-angle, beam-like performance on the higher bands. Since this is a multiband antenna, multiple lobes will be generated on most bands. On 40 meters the *"Short" CAROLINA WINDOM 40* acts much like a standard CAROLINA WINDOM 40.

The operating principle is simple but elegant. The horizontal portion of the antenna interconnects the three vertical sections and acts as both a feed system and a radiating counterpoise. The result is a multi-element inverted-vertical antenna that operates high in the air, free of ground losses. It is a very efficient antenna.

Can I make my CAROLINA WINDOM into a "Short" CAROLINA WINDOM?

Each DMU (Dedicated Matching Unit) in the CAROLINA WINDOM series of antennas is optimized for a specific antenna system. The DMUs cannot be interchanged. Just bending up a CAROLINA WINDOM means you would ***give up much of the performance capability of the "Short" CAROLINA WINDOM,*** and the CAROLINA WINDOM may not work properly on some bands.

Available in the new 200 watt version

Specifications

Freq. coverage:	40 - 10 meters
Radiator length:	Horizontal 42' or 50'
Verticals:	8'/10'/16' or 8'/10'/8'
Polarization:	Both vertical and Horizontal
Feed line:	50 ohm Coaxial cable
Tuner needed:	Yes on all bands
SWR:	Low, adj. w/tuner
Power Rating:	1500 Watts, CW or SSB ◊
Recommended Ht:	>30'- Usable at 25'
Radials:	Not required

◊ Not rated for AM, RTTY, and other high duty-cycle modes.

RECONFIGURABLE

CAROLINA BEAM <--> CAROLINA WINDOM

A very special feature of the *"Short" CAROLINA WINDOM*™ is that it is field reconfigurable. This means that you can easily convert your antenna to any of the various configurations. If the *"Short" CAROLINA WINDOMS's* pattern is too HOT for your operating style, you can change the dimensions of the vertical elements, or you can configure your "Short" CAROLINA WINDOM into a standard CAROLINA WINDOM All of the insulators are installed at the proper points to facilitate reconfiguration.

The *"Short" CAROLINA WINDOM's* new DMU is backward compatible.

A Better Idea!

The "Short" CAROLINA WINDOM 80™ and the "Short" CAROLINA WINDOM 40™ are super-hot, low angle radiators. You have your choice of radiation patterns to match your operating style and QTH. It only takes a few minutes to reconfigure these antennas. Just attach your support rope to the insulators and try all the configurations and see which works best for you. It's that simple.

List $129.95 **Catalog Special $110**

"Short" CAROLIINA WINDOM 40

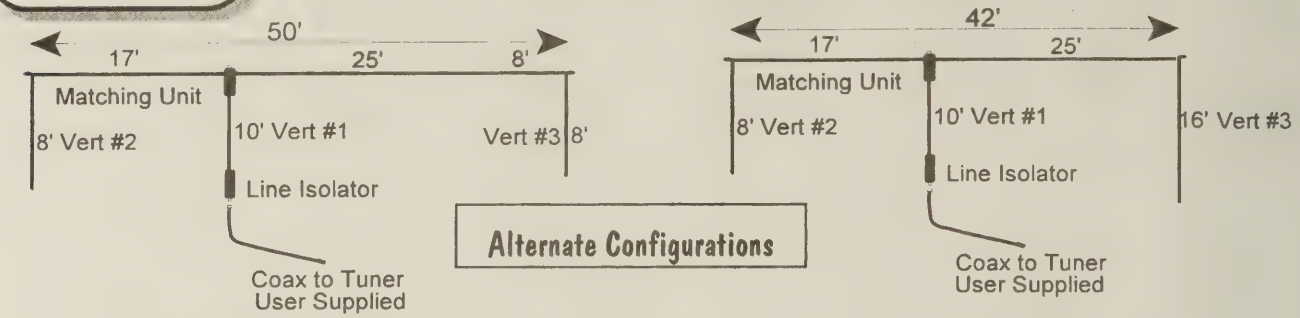
100 watt version, Type 2 or 3 - $100

RADIO WORKS Box 6159 Portsmouth, VA 23703 (757)-484-0140

80-10 Meters in only 50'

CAROLINA WINDOM "Short" 80 Special™

Formally CAROLINA BEAM 80 Special



Alternate Configurations

We are continually improving our products. Specifications are subject to change.

Length	Height	Bands Covered					Performance
50'	30'		40	20	15	10	Excellent
		80	30	17	12		Compromise

HOW IT WORKS

By using a new DMU, specially modified to handle the enormous RF current demands when operating on 80 meters, this new version of the *"Short" CAROLINA WINDOM 80 Special* permits 80 meter operation in only 50 or 66 feet. The Line Isolator also had to be modified to permit 80 meter operation.

The *"Short" CAROLINA WINDOM 80 Special* will give you a good signal on 80 meters, but expect to be down from a full-sized CAROLINA WINDOM 80. This should not prove to be a handicap since signals on 80 meters tend to be very strong. The difference between a "10 over S-9" signal and a "18 over S-9" signal will hardly be noticed in normal 80 meter operation.

On all other bands, 40-10 meters, full CAROLINA WINDOM 40 performance is provided. There is no compromise on these bands so all of the advantages of the *"Short" CAROLINA WINDOM 40* are yours.

This is a great way to get on 80 meters when space is limited. In fact, it's a great way to get on all the bands whether space is limited or not!

Specifications

Freq. coverage:	80 - 10 meters
Radiator length:	Horizontal 42' or 50' Verticals 8'/10'/16' or 8'/10'/8'
Polarization:	Both vertical and Horizontal
Feed line:	50-ohm Coaxial cable
Tuner needed:	Yes on all bands
Power Rating:	1500 Watts (< 500 w on 80 m) ◇
Recommended Ht:	>30'- Usable at 25'
Radials:	Not required

◇ CW/SSB duty-cycles only. Not rated for AM, RTTY or other high-duty cycle modes.

RECONFIGURABLE

CAROLINA BEAM < -- > CAROLINA WINDOM

Like all *"Short" CAROLINA WINDOM* antennas, the *"Short" CAROLINA WINDOM 80 Special* offers the field reconfigurability feature. This gives you great flexibility of installation. You can easily convert your antenna to a 50' *Short CAROLINA WINDOM 80 Special* or an even smaller 42' *"Short" CAROLINA WINDOM 80 Special.* If the *"Short" CAROLINA WINDOM 80 Special*'s pattern is too HOT for your operating style, you can change the antenna back to a standard CAROLINA WINDOM 80 Special.

All of the antennas insulators are installed at the proper point so that the only thing you have to do is tie your support rope to the appropriate set of insulators. It couldn't be simpler!

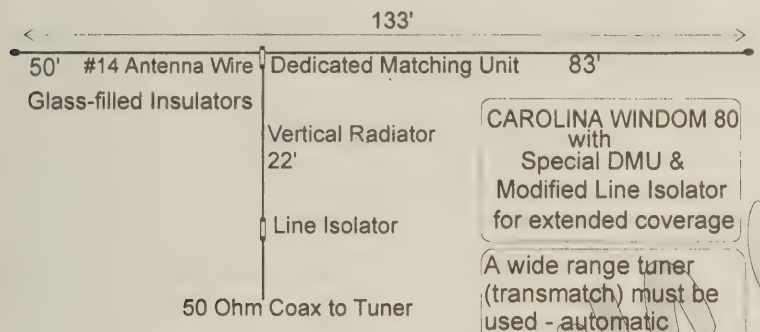
The MFJ-914 "range extender" will permit using your transceiver's automatic tuner with this antenna. Most internal automatic tuners will not work with this antenna.

List Price $139.95
"Short" CAROLINA WINDOM 80 Special **$125**

160 - 10 meters
Half-size - only 132'

CAROLINA WINDOM 160 Special

Used by club station 4U1WB at the World Bank



160 meter operation

The characteristics of the **CAROLINA BEAM** outlined on the previous page hold for the **CAROLINA WINDOM 160 Special** and the **CAROLINA WINDOM 80 Special**.

The **CAROLINA WINDOM** was designed for 80-10 meter operation with optimization on 80, 40, and 20 meters. It has always been a top performer on 80 meters. Now, with its new, improved DMU and Line Isolator, the **CAROLINA WINDOM 160 Special** may be used on 160 meters, too. If you want to get your feet wet on 160 meters, but can't put up a full-size 160 meter antenna, the **CAROLINA WINDOM 160 Special** is an excellent choice. You don't give up any of the **CAROLINA WINDOM's** superior performance on 80-10m and you pick up 160 meters in the bargain. Performance on 160 m will be down one or two S-units from a full-sized CAROLINA 160.

Specifications

Freq. Coverage:	160-10 meters see note
Radiator Length:	132'
Vertical Radiator:	22'
Polarization:	Vertical and Horizontal
Matching Method:	DMU + Your Tuner
Tuner Needed:	Yes, all bands
Power Rating,*	1500 watts, 80-10 m
	500 watts, 160 m see note
Recommended Height:	>40', usable @ 30'
Radials:	Not required

*** CW/SSB duty-cycles only. Not rated for AM, RTTY and other high duty-cycle modes.**

Note: Power Reduction on 160 meters

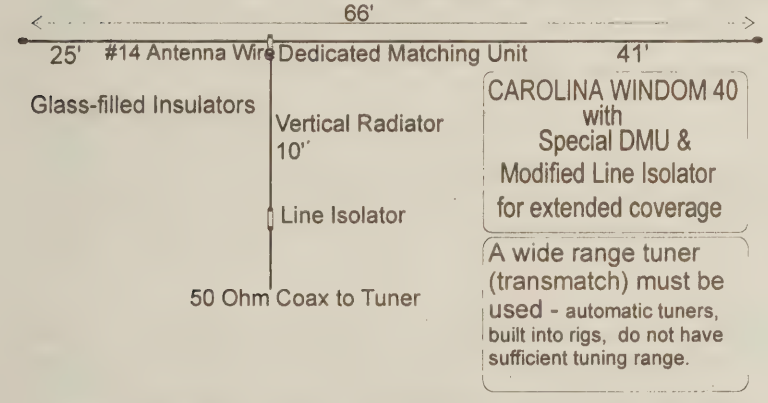
The **CAROLINA WINDOM** has been modified to permit operation on 160 meters. *You MUST reduce transmitter output power to under 500 watts, CW/SSB.* Higher power levels will destroy the Dedicated Matching Transformer or Line Isolator.

List Price $149.95

SPECIAL - $125

80 - 10 meters
Half-size, only 66'

CAROLINA WINDOM 80 Special



As noted in all **'Special'** versions of the **CAROLINA WINDOMs** and **CAROLINA BEAMs**, on the lowest frequency band, where the antenna is only 1/4 wavelength long, signal strength will be down but only about an S-unit or two from a full-size **CAROLINA WINDOM 80** or **CW BEAM 80**. On 80 meters, where signals are generally very strong, there is little difference between being "30 over S-9" or "20 over S-9." You certainly won't do as well if you use a conventional antenna at half its design or resonant frequency. The **CAROLINA WINDOM 80 Special** should serve you well on 80 and provide its usual outstanding 40 - 10 meter coverage.

Specifications

Freq. Coverage:	80-10 meters
Radiator Length:	66'
Vertical Radiator:	10'
Polarization:	Vertical and Horizontal
Matching Method:	DMU + Your Transmatch
Tuner Needed:	Yes, all bands
Power Rating*	1500 watts, 40-10 m
	500 watts, 80 m *
Recommended Height:	>35', usable @ 25'
Radials:	Not required

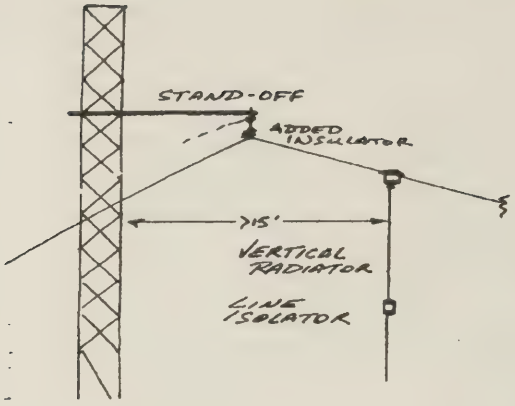
*** CW/SSB duty-cycles only. Not rated for AM, RTTY or other high duty-cycle modes.**

**** IMPORTANT*** - On 80 m, reduce power to less than 500 w and use a wideband transmatch.

List Price $129.95

ONLY - $115

Tower Mounting



Tower Mounting

IMPORTANT

Keep the Vertical Radiator section well away from conductive objects such as towers, masts, gutters, metal roofing, etc.

Tower mounting technique

A tower stand-off (6' or more) is recommended. A 10' piece of 2" or 3" PVC pipe may be used to hold the antenna away from the tower.

To facilitate tower mounting, an extra end-insulator has been placed on the long leg of the antenna. Use this insulator to support the antenna as illustrated at left. For maximum installation flexibility, the antenna wire is free to slide through the insulator. The Vertical Radiator and LINE ISOLATOR™ should be held at least 15 feet away from the tower.

When mounting the CAROLINA WINDOM near other antennas, there may be some interaction. Performance will not normally be adversely affected, but the radiation pattern and SWR curves may be influenced.

HOW DOES IT COMPARE

CONVENTIONAL VERTICALS - The CAROLINA WINDOM is much less difficult to install. It doesn't require an elaborate ground radial system. Performance is better due primarily to reduced ground losses and the lack of interference from nearby structures. The inverted-vertical nature of the CAROLINA WINDOM produces a nearly ideal low angle radiation pattern.

DIPOLES - On the low bands especially, dipoles and similar antennas, installed at normal heights are limited in long-haul capabilities. The radiation pattern of dipoles and similar antennas is predominately at very high angles. Installation of the CAROLINA WINDOM is not any more difficult, and performance is far better. As an added bonus, the CAROLINA WINDOM is a multiband antenna. There is no reason to install dipoles when CAROLINA WINDOMS are so much better.

FULL WAVE LOOPS - The CAROLINA WINDOM will generally outperform a well designed and properly installed full-wave loop out to the first skip distance and holds its own up to the second hop (about 5000 miles). After that, the loop and especially the SuperLoop will sometimes have the advantage. It depends on the heights of the antennas. The CAROLINA WINDOM is far easier to put up and has the advantage of multiband operation.

BEAMS - The CAROLINA WINDOM is usually within about 1 S-Unit of a trap tribander at the same height. Of course, the beam has the advantage of rotation and a front-to-back ratio. The disadvantage of the beam is, of course, high cost and installation difficulty. Even if you have the beam in the air, you will need an excellent antenna to cover 80, 40, 30 and the other WARC bands.

If you haven't heard the CAROLINA WINDOM on the air, you will soon. When you do, YOU'LL WANT ONE. ***It's the best money you will ever spend to improve your signal.***

G5RV PLUS™

We have some nice photos of Louis Varney, G5RV, on our web site. Take a look.

All Bands 80 - 10 meters, + 30, 17, 12 m

There has been much written about the G5RV. Unfortunately, much of it is incorrect. The claims of most commercial antenna builders are simply fantasy. The record was set straight when the G5RV's developer, Louis Varney published an article in the ARRL Antenna Compendium #1. Unfortunately, most G5RV builders haven't paid much attention to Mr. Varney's article. We did!

The original G5RV is an efficient, all band, antenna. It is shorter than a full size 80 meter antenna. This makes it appealing to those who have limited space. The G5RV will give good results on most bands with minimum effort.

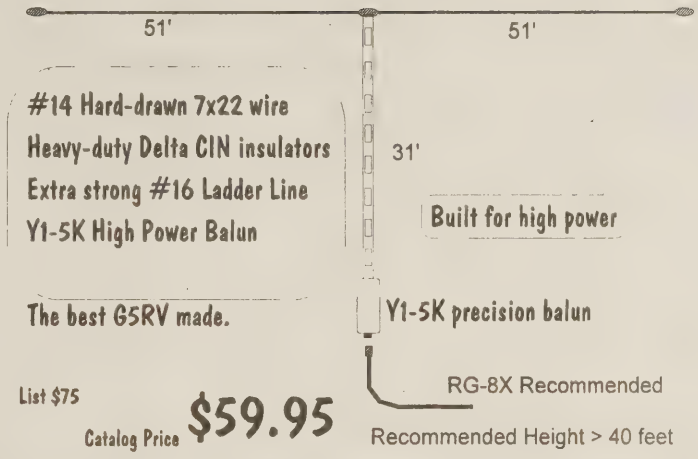
The RADIO WORKS' 'G5RV PLUS' embraces two outstanding improvements over the many copycat versions of the G5RV on the market. First, I have added a Y1-5K, our precision, Current-type balun at the transition between the balanced stub and unbalanced coaxial cable feed line. The second improvement is the choice and length of matching stub and RG-8X feed line combination. The matching stub is reactive on most bands. The reactive nature of the antenna and stub makes matching difficult unless a wide range antenna tuner is used.

After careful analysis, I changed the matching system for the best compromise on all bands. A change in stub resonance and a specific feed line length was necessary to achieve the best match on each band. Still, the match is not perfect on any band. It is lowest on 20 meters where the SWR drops to around 1.8:1 under ideal conditions. On all other bands, the SWR will be higher. Even with a slightly elevated SWR, losses in the system are low. Unless you are using a rig with tube finals that can accept a moderately high SWR, an antenna tuner is necessary. This advice goes for any G5RV. Contrary to what many antenna makers claim, the G5RV requires a transmatch unless your rig can tolerate a moderately high SWR.

The Y1-5K, Current-balun© keeps RF off the coax and reduces any chance of RF feedback problems.

Combining these technical improvements with the G5RV's own attributes produces a very good antenna system. The RADIO WORKS' NEW G5RV is an excellent combination of performance modifications, high quality, and high power parts. You can't find a G5RV that works better than this one.

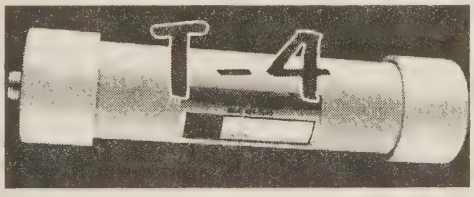
The reduced size of the G5RV is one attractive feature. A second is multiband operation with coax feed. Coax is so much more convenient than ladder-line or open-wire. Further, most modern transmatch circuits do not work well when feeding reactive, high impedance feed lines. The G5RV does not require a balanced output transmatch. This means that you can use the G5RV PLUS with nearly any antenna tuner, including those neat little 'automatic tuning units' that some rigs have. One short caveat though, the SWR may get out of the tuning range of the automatic tuners on some bands. It all depends on your particular installation.



Check out the top quality parts used in our G5RV

Watch out for all the cheaply constructed G5RV antennas now made by just about everyone with a soldering iron. Sure, a G5RV is a "no brainer" when it comes to making an antenna. It's simple, and anyone can make one and put it on the market. Of course, if you want one that will stay in the air more than a few months, take a look at the construction. One major manufacturer uses little pieces of printed circuit board for insulators. Quality parts are the major ingredients in any successful antenna. Don't accept less than the best.

"Quick Fix™" your G5RV



If the RADIO WORKS did not make your G5RV, all is not lost. You can help it out by adding an effective Line Isolator to properly interface your G5RV' balanced line to your unbalanced coaxial cable feed line. Just add a T-4 in series with your feed line at the junction between the ladder-line and coax to solve your feed line radiation problems. The T-4 is the perfect addition to any G5RV. Order a UHF double male adaptor to connect the Line Isolator to your G5RV.

The RADIO WORKS Box 6159 Portsmouth, VA 23703 (757) 484-0140

Simply Terrific

SuperLoop 80™

It's Time for a Change!

80-10 meters +30, 17, 12 m WARC

I've used this antenna for many years. At various times, I've told you about working ***50 countries*** in just *5 hours* or putting **76 countries** in the log in two evenings during at the bottom of the sunspot cycle.

Now, that the SuperLoop 80 has been installed at W4THU for several years, I'm glad I didn't put up a new tower and beam, because I haven't needed them. This is an impressive antenna! Jim, W4THU

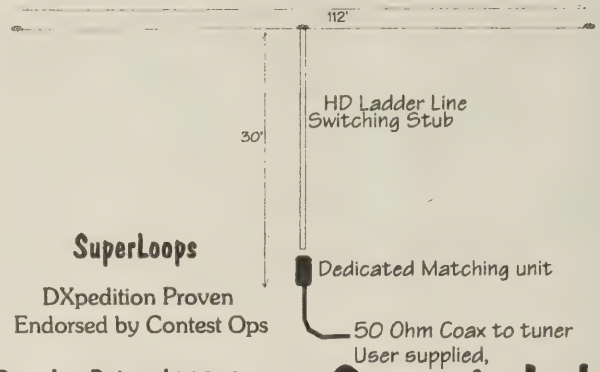
SPECIFICATIONS

Freq. coverage:	80 - 10 meters
Polarization:	Both vertical and horizontal
Radiator length:	Full wave (80)
Matching method:	Combination of reactance + stub & dedicated tuning unit.
Tuner needed:	Yes, all bands
Recommended coax length:	½ wave length * (I.e., 99' RG-8x)
Power Rating:	1500 Watts, CW/SSB ◊
Recommended height:	>40'
Radial:	Not required.

*Coax length is not critical. Any length may be used.

◊ Cw/SSB duty-cycles only. Not rated for AM, RTTY, PSK-31 and other high duty-cycle modes.

We are continually evolving and improving our products. Specifications are subject to change any time we can make the SuperLoop better.



Regular Price $129.95

Special $110

The RADIO WORKS' New SuperLoop 80™ is a high performance, full size, full-wave, 80 meter loop antenna. On 40 meters the New SuperLoop 80™ is a 2 wavelength open loop or Bi-Square. The stub in the top leg of the antenna opens the loop when operating on 40 meters and selected other bands. This improves the antenna's radiation pattern. Its gain is around 4 dB, but it will seem much higher due to its excellent, low angle, radiation pattern.

The Dedicated Matching Unit with all the other components in the antenna work together to provide a well managed SWR on all bands. While the SWR is not below 2:1, it is low enough to permit the use of coaxial cable. System losses are low.

The New SuperLoop 80™ is an outstanding performer on all bands, 80 - 10 meters. Combine all band operation, coax feed, with gain on all bands, and the New SuperLoop 80™ is the obvious choice in a multi-band DX loop antenna system.

The MFJ-914 "range extender" will permit using your transceiver's automatic tuner with this antenna.

The New SuperLoop 80™ has been used on several DX'peditions. The first was Navassa '88. Since then, the SuperLoop™ has been installed in DX stations all over the world. As I promised, when we come up with a better idea, you will see it in our products. So, stand back - The New SuperLoop 80™ has an improved, low loss, matching system. You'll get even better performance from this new SuperLoop.

- ☞ All bands, 80 - 10 meters
- ☞ Low receiver noise
- ☞ Automatic switching between multi-wavelength loop and Bi-Square modes.
- ☞ Exceptional Performance on every band!
- ☞ 50 Ohm Feed
- ☞ Superb Receive antenna- SWLs take note
- ☞ All parts, DMU, ready to go Solder only two wires
- ☞ Easy to follow instructions

Which side is up?

While the standard configuration shown above is recommended, you may mount the SuperLoop upside down, tilted, or sloped and supported in the shape of a square, triangle, or rectangle. Configurations with the greatest area within the loop generally give the best performance.

No room for the SuperLoop 80™?
Check out the NEW SuperLoop 40™.

The RADIO WORKS Box 6159 Portsmouth, VA 23703 (757) 484-0140

THIS IS IMPRESSIVE!

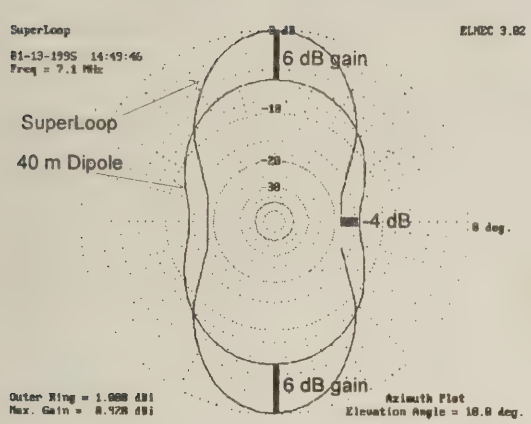


Figure 1 40 m Azimuth Plot @ 10°

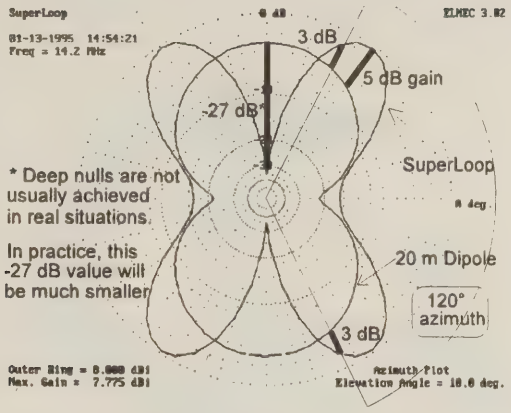


Figure 2 20 m Azimuth Plot @ 10°

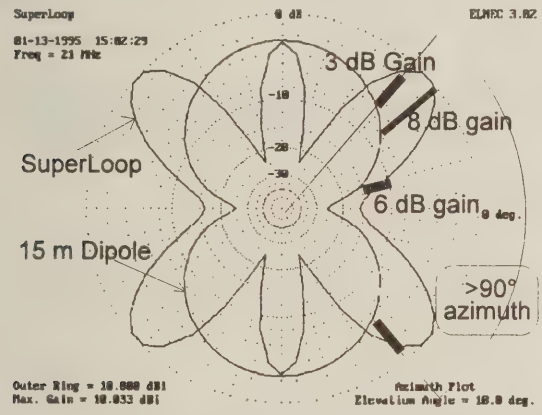


Figure 3 15 m Azimuth Plot @ 10°

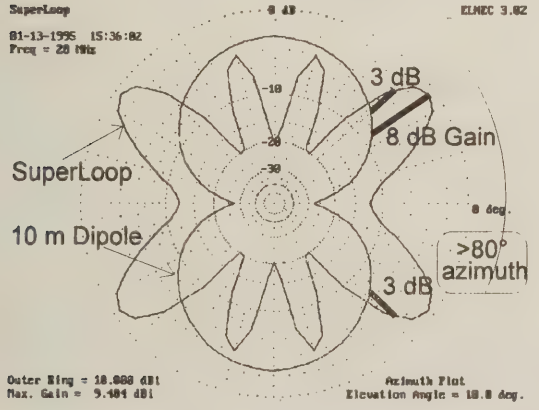


Figure 4 10 m Azimuth Plot @ 10°

Figures 1 through 4 show the SuperLoop's radiation pattern at a very low 10°takeoff angle. On 80 meters, the SuperLoop performs like a very efficient full-wave loop with some broadside gain. Most of the time, I do not have to wait in line in the DX window on 75 meters. On 40 meters, the antenna switches to a Bi-square and at very low radiation angles, the gain is computed to be 6 dB. At higher radiation angles, the gain will be closer to the Bi-square's typical 4 dB.

At higher frequencies, large, multi-wavelength loop antennas often perform poorly. However, the SuperLoop's configuration generates multiple lobes with significant gain over a wide range in azimuth. For example, on the 20 meter band the SuperLoop has a useful performance advantage over 240° of azimuth (120° + 120° for front and back patterns). Of course, along with multiple lobes comes multiple nulls. The computer shows these nulls to be quite deep, but in practical situations, the nulls are generally far less pronounced than shown.

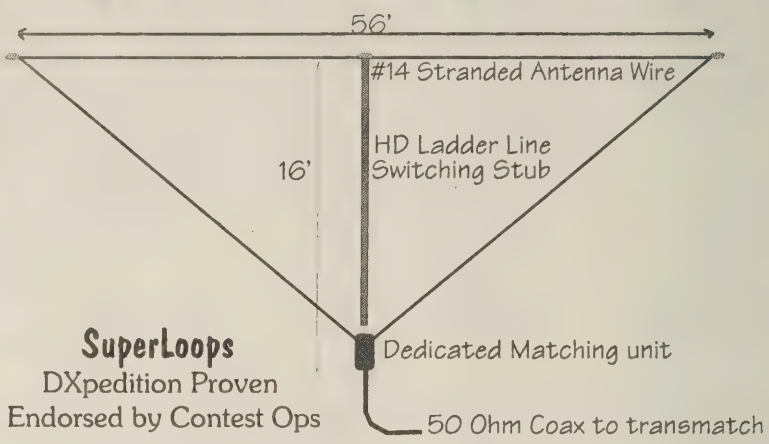
Looking at Figure 3 and 4, these patterns are familiar for large antennas operating 6 or 8 times the fundamental frequency of the antenna. Significant gain is generated at the very low radiation angles needed for DX operation. On 10 and 15 meters, there is a significant gain advantage in most directions and the additional lobes generated help fill the nulls that give excellent results in nearly every direction.

You can see why the performance of the SuperLoop is impressive on the air. With radiation patterns like these, filling the DX log book is easy!

SuperLoop 40™

You Asked for it - Now it's here!

40-10 meters +30, 17, 12 m WARC



SuperLoops
DXpedition Proven
Endorsed by Contest Ops

SPECIFICATIONS

Freq. coverage:	40 - 10 meters
Polarization:	Both vertical and horizontal
Radiator length:	Full wave (40)
Matching method:	Combination of reactance a stub & dedicated tuning unit.
Tuner needed:	Yes, all bands
Recommended coax	RG-8X, any length
Power Rating:	1500 watts (CW & SSB) ◊
Recommended height:	>30'
Radials;	Not required.

◊ Reduce power on AM, RTTY, and high duty-cycle modes.
We are continually evolving and improving our products. Specifications are subject to change any time we can make the SuperLoop better.

Regular Price $120

Special $95

All bands 40 - 10 meters
Low noise reception
Automatic mode switching between Loop and Bi-Square modes. Switches itself into the optimum configuration for each band.
Exceptional Performance
50-ohm Feed
Superb receive antenna - SWLs take note
All parts, DMU, ready to go. Solder only two wires.
Easy to follow instructions

A antenna tuner is required

Just think of the SuperLoop. It has served on many DX'peditions and worked hundreds of countries from the backyards of DX'ers all over the world. Then imagine an antenna half the size of the original SuperLoop optimized for 40 and 20 meters. All of that incredible performance is now concentrated on 40 and 20 meters. The SuperLoop offers all the gain of a full-wave loop on 40 meters and the outstanding performance of a Bi-square on 20 meters. If that isn't enough, all the higher frequency bands are thrown into the bargain. Wait until you see what this antenna can do on 10 meters.

The SuperLoop 40 uses the same outstanding technology as the SuperLoop 80. This is a high performance, full- size, full-wave, 40 meter loop antenna. On 20 meters the SuperLoop 40 converts itself into a two wavelength open loop or Bi-Square. The stub in the top leg of the antenna opens the loop when operating on 20 meters and selected other bands. This improves the antenna's radiation pattern and matching. In theory its gain is about 2 dB on 40 meters and around 4 dB on 20 meters, but it is actually much higher due to the highly compressed low angle radiation pattern. The Dedicated Matching Unit, along with all the other components in the antenna work together to provide a well-managed SWR on all bands. While the SWR is not below 2:1, it is low enough to permit the use of coaxial cable. System losses are low. Beating the SuperLoop 40 with anything short of an expensive tower and beam will be hard. Combine multiband operation, coax feed, gain on all bands, and the SuperLoop 40 is the obvious choice in a small profile, multiband DX loop antenna

Custom Made Antennas

We can build CAROLINA WINDOMS and dipoles with insulated wire.

It is not possible to use insulated wire with loop antennas. The wire will not twist back on itself well enough to hold an insulator in place.

#13 (19-strand) VariFlex copper-clad steel insulated wire. Very tough, slick, black insulation. Add 16 cents per foot plus $10.

#12 (259-strand) PE insulated copper wire A copper wire with a tough black insulation. Not as stiff as #13. Add 26 cents per foot plus $10.

#14 (168-strand) PE insulated copper wire Same as above but with #14 wire. Add 19 cents per foot plus $10.

#12 (259-strand) PVC insulated copper A very flexible insulated copper wire, available in green or black color. Add 22 cents per foot plus $10.

#14 (168-strand) PVC insulated copper As above with #14 wire. Add 17 cents per foot plus $10.

#12 (7-strand) Copper-clad steel Uninsulated - This is the standard copper-clad (copperweld-type) wire. Call for quote.

To calculate the price of the antenna, simply multiply the cost, per foot, of the wire times the length of the antenna. Add the building cost plus the price of the antenna and the cost of the wire.

Example - A CAROLINA WINDOM 80 is 133 feet long. #13 wire is desired. Multiply 133 (wire length) times .16 (wire cost) = $21.28. Add to that the building cost of $10 and the price of the antenna, $95. The total is $95 + $10 + $21.28 = $126.28

BigSig Loop *Vertically Radiating Dipole*

Mini-Loop 40 6 & 2 meter Long Wire

By popular request, I'm bringing back some of the antennas we've been building only by special request. Since there is an obvious popularity, I'm again listing these antennas in the catalog. The antennas are featured on the pages which follow. Call to order yours today. Allow two or three weeks for us to complete your antenna. These are all special purpose or high performance antennas

ULTIMA™ DIPOLE

High power conventional dipoles

SPECIFICATIONS

Bands:	Any HF frequency
Radiator:	½ wavelength
Feedline:	50 ohm coax, user supplied
Balun Type:	B1-5K
Power Rating:	2 KW CW/SSB
Matching Method:	Balun
Transmatch:	Not required
SWR:	Low, field adjustable

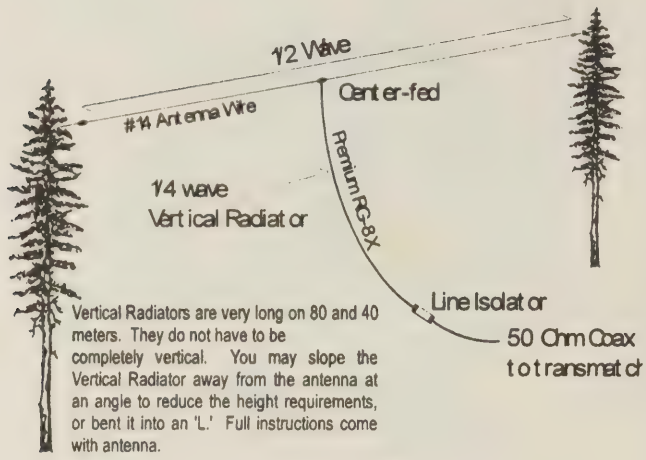
Ultima Dipoles are conventional antennas built with only the best parts. The B1-5K is the best 1:1 balun made for wire antennas. The #14 hard-drawn antenna wire provides excellent strength but is light in weight. Our new end-insulators provide lowest leakage path. With CoaxSeal®. Assembled.

UD80	**80/75 m**	**(125'-132')**	**$52.95**
UD40	**40 m**	**(66')**	**$48.95**
UD30	**30 m**	**(46')**	**$46.95**
UD20	**20 m**	**(33')**	**$44.95**
UD15	**15 m**	**(22')**	**$44.95**
UD12	**12 m**	**(18')**	**$44.95**
UD10	**10 m**	**(16')**	**$44.95**

VRD VERTICALLY RADIATING DIPOLES' using the 'VERT™' Effect

The NEW Dipole "Under the sun!"

Check our web site for full details http://www.radioworks.com


1/2 Wave
#14 Antenna Wire
Center-fed
1/4 wave
Vertical Radiator
Premium RG-8X
Line Isolator
50 Ohm Coax
to transmatch
Vertical Radiators are very long on 80 and 40 meters. They do not have to be completely vertical. You may slope the Vertical Radiator away from the antenna at an angle to reduce the height requirements, or bent it into an 'L.' Full instructions come with antenna.

The VRD is a high quality dipole, modified to take full advantage of the 'VERT' effect (see our web site for an explanation of the 'VERT' effect). The result is spectacular. Users report exceptional performance. Several low band DX'ers have switched from their previous systems to the VRD and are keeping quiet about their new secret weapon. This is a high performance system capable of producing a very low angle radiation pattern. In most pileups, you should be at the front of the line. That is, unless there are other VRDs in the pileup!

SPECIFICATIONS

Bands:	**Single band 80 - 10 m + WARC Any band, special order.**
Horizontal Radiator:	**½ wavelength**
Vertical Radiator:	**1/4 wavelength, supplied**
Feedline:	**50 ohm coax, user supplied**
Balun Type:	**Dedicated Line Isolator**
Power Rating:	**1.5 KW ***
Coax:	**50 ohm, user supplied**
Tuner needed:	**No**
SWR:	**Low**

*** CW/SSB duty cycles only. Not rated for AM, RTTY and other high duty-cycles modes.**

THE PARTS

- Special, Wide Band, High Isolation Line Isolator
- #14 (7x22) hard-drawn antenna wire
- Vertical Radiator is premium RG-8X
- Glass-filled end insulators
- CoaxSeal®
- Completely assembled
- Easy to follow instructions
- Low cost, BIG SIGNAL

Special, wideband, Line Isolator

Some method must be used to isolate the radiating part of the feedline from the remaining non-radiating portion. A very high impedance circuit must be used to stop RF current at a precise point on the feedline. Winding the coax into a coil and resonating it with a capacitor across the coil worked but wasn't the answer. It was mechanically cumbersome and difficult to tune. A simple, broadband device was necessary. The answer was the CAROLINA WINDOM'S Line Isolator. The Line Isolator required some modification to optimize it for the VRD application, but the result is a very efficient, stable, wideband Line Isolator.

The VRD's Line Isolator does not affect the RF traveling inside the coax. It simply produces a very high impedance to RF current flowing along the surface of the coax's shield. Inserted into the coax at the critical point on the feedline, the 'VERT' effect develops in a very predicable manner.

What to expect

On the air results confirmed the computer analysis. 80 and 40 meter tests closely followed the predicted radiation patterns. Comparing the VRD and an identical dipole fed with a quality 'Current-type' balun produced surprising results. On 80 or 40 meters, daytime operation with either antenna produced similar results. At night, when the band lengthens out, signals arrive at lower angles, and the low angle vertical pattern becomes more and more obvious. In my tests, I had VRD and conventional dipoles supported at the same heights and orientation. In most directions, nighttime DX was 6 to 12 dB stronger on the VRD.

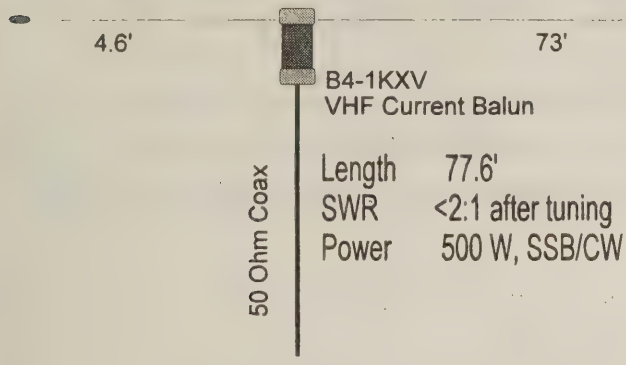
The computer analysis did not show any great improvement on 20 - 10 meters, especially when antennas are supported high in the air, since VERT is a ground effects phenomena. On the air testing produced unexpected results with the VRD. When supported at usual heights, 25' - 35' high, the VRD nearly always had the advantage over conventional dipoles. At times, depending on the propagation path, the VRD yielded the same 6 - 12 dB improvement observed on 80 and 40 meters.

Gain the performance advantage. Replace all those conventional dipoles with VRDs. The 'VERT' effect transforms a mediocre dipole antenna into a low angle powerhouse. There's no reason to be a "little pistol" when you can be a "BIG GUN!"

MODEL	BAND	HORIZ	VERTICAL	PRICE
VRD80	80 M	132'	74'*	$90
VRD40	40 M	66'	37'	$80
VRD30	30 M	46'	25'	$75
VRD20	20 M	33'	18'	$70
VRD17	17 M	26'	15'	$70
VRD15	15 M	22'	12'	$70
VRD12	12 M	18'	10'	$70
VRD10	10 M	16'	9'	$70

*Long Vertical Radiators may be sloped away from the antenna or supported as an 'L' with part horizontal to the ground in order to reduce height requirements.

6 & 2 meter Long-Wire

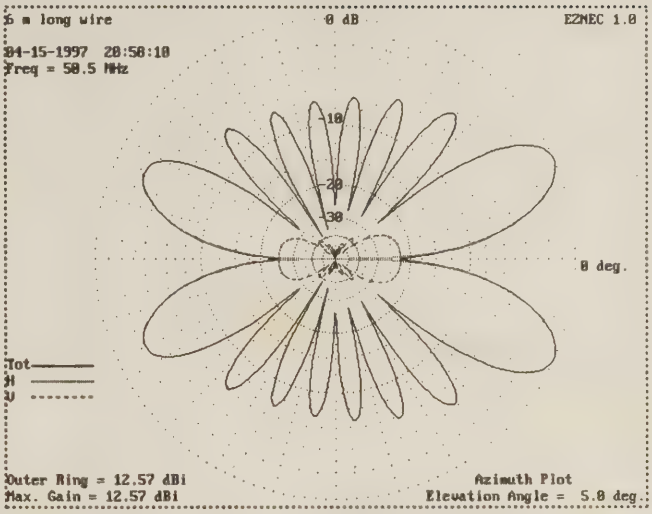


This is a simple long-wire antenna. The maximum gain available is less than in other, more complex antennas of the same size. However, there is much to recommend this antenna. Unlike higher gain designs, the long-wire antenna has several major and minor lobes which provide coverage in most directions. Higher performance antennas will have a more beam-like radiation pattern, and you will have to use more than one antenna to cover all the useful azimuth headings.

Polarization and Performance

The performance of this antenna on 6 meters is excellent. The surprise is its 2 meter coverage. We discovered that the terrific, new B4-1KXV balun is so good that this antenna works on both 6 and 2 meters. It produces a horizontally polarized radiation pattern that is useful for station-to-station communications, DX, even some satellite work. However, base to mobile operation will be compromised due to the mixed polarization of horizontally and vertically polarized antennas. To work mobile stations from your QTH a high gain vertical antenna is recommended.

Long-wire antennas are excellent in many ways, but you should be aware that this antenna will not produce a 1:1 SWR, even when carefully resonated to your favorite frequency. However, you should be able to keep the SWR below 2:1 across much of both bands. Trimming the antenna for lowest SWR is not difficult. Simply adjust the length of the long and short ends of the antenna until the SWR is lowest.



Azimuth Pattern of 6 meter Long Wire.

The gain available is quite high for such a low-cost, easy to install antenna. Long wire antennas produce many lobes and nulls. You will want to point the two largest major lobes in the directions DX is most likely to arrive. The 6 & 2 meter Long Wire gives you a lot of coverage for an antenna no more difficult to install than a 40 meter dipole.

On 2 meters, there are three times the number of lobes, and the pattern essentially sprays RF in all azimuth directions. Orientation on this band is not critical.

Completely assembled and features 7x22, hard-drawn antenna wire, HQ-2 end-insulators, CoaxSeal,™ instructions, and the new B4-1KXV, 4:1 Current Balun. You supply only the coax and the support rope.

List Price $63.95

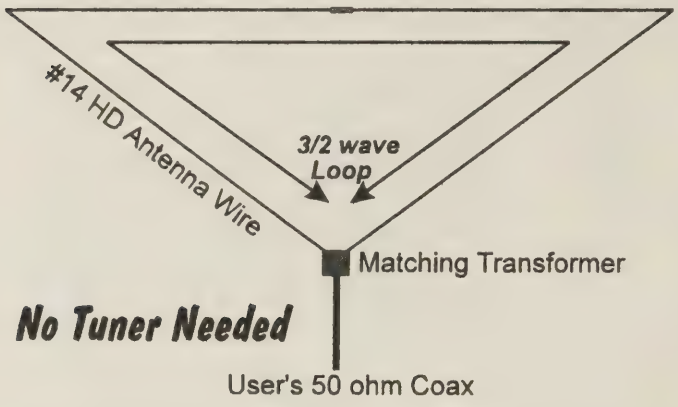
Special Introductory Price **$50**

Check out the new CAROLINA WINDOM 620.

Big Signals Start Here!

The High Performance Loop

BigSig Loop™



The perfect, top performance antenna for this point in the sunspot cycle.

SPECIFICATIONS

Freq. coverage:	Any single band, 80 - 10 meters
Radiator length:	3/2 Wavelength
Feedpoint Impedance:	50 Ohms
Matching Method:	Dedicated Matching Unit
Feedline Recommended:	RG-8X, RG-213
Feedline Length:	½ λ recommended
Power Rating:	Legal Limit, SSB/CW *
Radials:	Not required.

We are continually improving our products, therefore, specifications are subject to change.

*** CW/SSB duty-cycles only. Not rated for AM, RTTY or other high duty-cycle modes.**

>3 dB Gain!

Double your signal - Double your fun!

Even more gain at very low takeoff angles

The *BigSig™ Loop'* is a single band antenna which offers the same spectacular level of performance available only with the fantastic SuperLoop. *'BigSig™ Loops'* are significantly better than common full-wave loops.

The 'BigSigtm Loop' is a 3/2 wavelength loop. Its gain approaches that of the famous 'Bi-Square' antenna, however, the *'BigSig™ Loop'* is far smaller and more convenient than the 'Bi-Square.'

The *'BigSig™ Loop'* is the perfect way to put a big signal on your favorite band. It comes to you assembled except for two connections which must be soldered.

You may support your *'BigSig™ Loop'* as a delta-loop with the apex up or down. The larger the internal area of the loop, the better the performance. With this in mind, it is best to configure your *BigSig™ Loop'* as a square or rectangle.

The *BigSig™ Loop'* has a large capture area, low receiving noise, excellent, low angle radiation pattern, and good signal gain. It is a high performance antenna that gets the job done.

The enhanced, low angle radiation pattern and gain give you the competitive edge you need when chasing the rare ones.

The RADIO WORKS
Box 6159, Portsmouth, VA 23703
(757) 484-0140

Features

- ☞ Dedicated matching Unit.
- ☞ #14 stranded, 7x22, hard-drawn copper antenna wire.
- ☞ Glass-filled ABS insulators
- ☞ Assembled, only two connections to solder.
- ☞ CoaxSeal® is furnished
- ☞ Easy to follow instructions.

See custom building notes.

80 M **$85**
Length of wire in loop = 420'

40 M **$75**
Length of wire in loop = 210'

30 M - 12 M versions **$70**
Length of wire in loop = 150' - 56'

10 m **$65**
Length of wire in loop = 54'

6 m **$55**
Length of wire in loop = 30'

It's real gain - you can't hide it!

BigSig Loop™

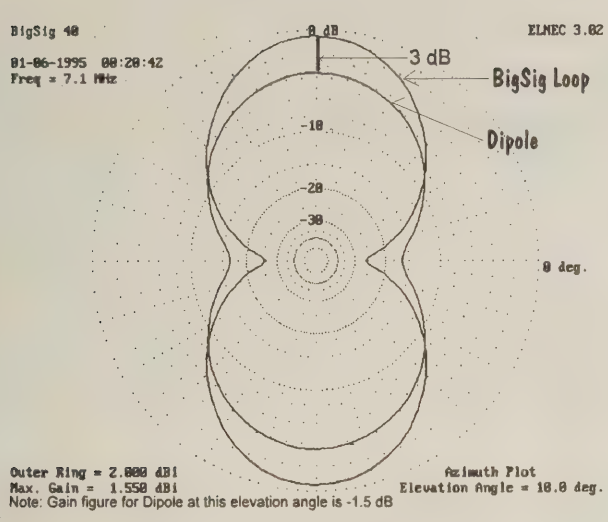


Figure 1
Azimuth Plot with a takeoff angle of 10°

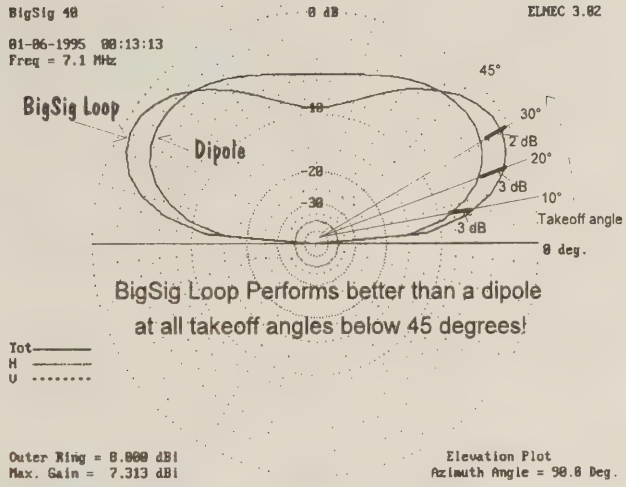


Figure 2
Broadside Elevation Plot of BigSig Loop

+3dB Gain for Great DX

The *BigSig Loop* modeled in Figures 1 and 2 is an "apex-down" Delta-Loop fed at the bottom. The matching transformer provides a low SWR (less than 2:1 and 1.5:1 is typical at resonance) throughout the 40 meter band. Best of all, the *BigSig Loop* provides a very generous +3 dB of gain at the low radiation angles necessary for DX work.

An added benefit is the gain provided at all takeoff angles below 45°. This advantage is easily seen in Figure 1. Comparing the *BigSig Loop's* radiation pattern to a dipole supported at a similar height, the *BigSig Loop* wastes far less energy at high radiation angles and concentrates more RF energy at desirable lower angles.

The broadside radiation patterns of the Dipole and *BigSig Loop* have similar shapes so you don't have performance limited to a narrow range of headings. Gain is accomplished by lowing the radiation angle, not by compressing the beamwidth.

What about the other bands?

You will enjoy exceptional performance on 80 meters with a *BigSig 80 Loop*. Dipoles are very poor low angle radiators on 80 meters unless you can support them very high in the air (120' for more). The 80 meter *BigSig Loop's* low angle characteristics are similar to the ones shown here. You can expect excellent results on the DX portions of the 80 and 75 meter bands while losing little performance at moderately close distances.

On 20 meters, simple, high performance antennas are easy to construct and support at effective heights. However, the *BigSig Loop* provides excellent performance combined with easy installation. It's a winning combination on any band you choose.

The *BigSig Loop* is an easy way to double your effective power, and concentrate it at radiation angles where it will do some good. An added benefit is the excellent receiving characteristics of the *BigSig Loop*! ***Can you afford to give up this kind of performance now that the competition is so heavy on 80 and 40 meters?***

The RADIO WORKS Marine & RV

I've been cruising around the internet trying to educate myself about the marine electronics market. You see, over the past 18 months, we've received hundreds of requests for our "RFI Quick Fix" for use in marine environments.

I have to say that there are a lot of marine products that I'm not familiar with. Now, it's not that I'm totally unfamiliar with boats, yachts, ships, and everything in between. After all, I live in the Norfolk, Virginia area. I do have to say that my involvement is more admiration than participation. I've never had the privilege of sailing the high seas, visiting obscure islands, or witnessing both the sunrise and sunset at sea. Instead, I've chosen to be an RV'er. It fits my lifestyle. There are similarities, though. Many of the issues involved with installing sophisticated electronics in either RV or marine applications present similar challenges - especially in the areas of grounding and solutions to RFI problems. And, that's where my expertise lies. The RADIO WORKS has been producing the "RF Quick Fix™" since 1986.

Back to my surfin' the internet story. There were products and brands that were new to me, but, there were many products that are very familiar. In fact, some of them are in this catalog. Most interesting are the prices charged for things we sell for much less. To say the least, I was shocked. I saw PL-259 connectors on one site selling for $3.25 each. We sell a better quality connector of the same type for $1.29 (most of the time we have them on sale for $1). There were ½-wave vertical marine-band antennas for $79.95. We sell the same product for $39.95. The list goes on.

Now that our maritime friends have discovered the "RFI Quick Fix™," and have seen what the Line Isolators™ and ferrite cores will do to solve their onboard RFI problems, we find ourselves in a different and exciting world - marine electronics. Thanks for inviting us on board.

Based on the quantity of units leaving here heading for marine applications, word of the "RFI Quick Fix™,"is spreading fast. I always like to recognize and thank those who have offered advice and encouragement. Two such fellows are Steve Waterman, K4CJX of WinLink™ and Jim Corenman, KE6RK, author of AirMail™. I sincerely appreciate their suggestions and willingness to share their knowledge. Both are important figures in worldwide internet via HF radio.

With their advice, I'm developing some new devices to meet your specific needs. I'm excited to announce a brand new line of reduced size 100 watt RF Line Isolators™. We also have the first of several "Power & Control Line Isolators™" in this catalog. To help with installation, these devices are being put together in kits which will put all the related parts together. And, speaking of kits, we have a special weatherproofing kit for power and RF connectors. Since we are an antenna manufacturer and supplier, just about everything in our catalog pertains to your radio installation and proper operation. Every radio installation requires coaxial cable, power cable, connectors and the like. You'll find we have the best parts at the best prices.

I'm not leaving out the RV'ers. Besides all the necessary RFI protection devices, I'm developing a couple of antenna systems just for you.

But, I can use your help. Feedback is always welcome. Let me know how well products are working for you. Let me know what you need in the way of electronic parts and devices. If I can find a good source, I'll put them into my catalog and on our web site. You can count on us to bring these things to you at the lowest possible prices.

I have no illusions about becoming a big marine or RV electronics distributor. I'm not interested in selling equipment, anyone can do that. Certainly, we're going to continue to concentrate on those things that have made us successful - the world's best wire antenna systems, current baluns, Line Isolators and associated products. That's good for us, but more important, that's good for you. With our volume purchasing power, we can bring electronic parts to you at significant savings.

As soon as I finish this catalog, I'm going to begin developing a new "Manine & RV" section on my web site. There will be all sorts of product offerings, articles and how-to suggestions. If it turns out like the rest of our web site, it'll be a fun and informative place to visit.

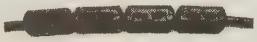
Marine & RV

Many products applicable to this section are presented in detail in other parts of the catalog. I present them here as a reminder.

"RFI Quick Fix™"

Our new T-4-500 Line Isolators are perfect in marine and RV installations.

PCLIs keep RF off your power system and control line. They are step 2 in the RFI battle.



Ferrite Cores

Microphone cables, computer cables and the like are all susceptible to ground loop and RFI problems. Our RFI Ferrite Cores offer the best and most effective solution to problems in this area. This is another step in the RFI battle.

Metz Antenna

Designed specifically for marine environments.

These ½ wavelength, ground independent ventricles are totally sealed against the weather and have a stainless steel whip. An L-bracket is included for easy installation on any surface. Gain of the marine and ham antennas is 3 dB. They are available for marine frequencies as well as the 144 and 440 MHz ham bands. Special versions for scanners, AM/FM and .1-30 general coverage are also available on special order.

LDG Automatic Tuners

Coaxial Cable

We are now stocking our favorite coaxial cable, RG-8X with a white jacket. We'll also stock RG-58 with a white jacket. This makes installations look better in marine and RV applications.

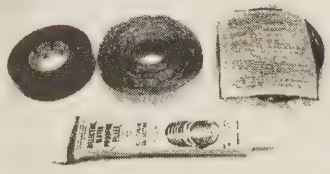
We have several types of line that is useful for general purpose applications. Our Dacron double-braid type has a long useful life and will far outlast Nylon and Polypropalene in the sun. Our Kevlar is a small, yet incredibly strong line.

Connectors

We stock the most popular coaxial connectors and adaptors. We also have PL-259 types in silver or gold, both with Teflon insulation.

Disconnects

Available in 2-pin, 4-pin, and 8-pin. These are used to install PCLI's or for general projects where you need to have an easy way to disconnect a cable.



Any coaxial or power cable exposed to the weather should be weatherproofed properly. We have just what you need for any project. Check out the kits, too.

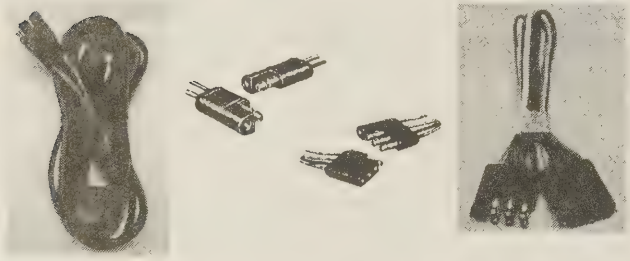
RFI & Sealing Kits

RFI Kits

To make solving RFI problems easier, we have assembled kits of parts that you will need. Each kit contains a Line Isolator[tm], a 3-foot deluxe jumper cable and six RFI cores. Caution: It is not safe to use radio equipment when vehicle is in motion. RFI can effect the vehicle's onboard computer.

RFI Kit #1	T-4, jumper, and 1/4" cores	**$50**
RFI Kit #2	T-4-100, jumper, and 1/4" cores	**$50**
RFI Kit #3	T-4, jumper, and ½" cores.	**$60**

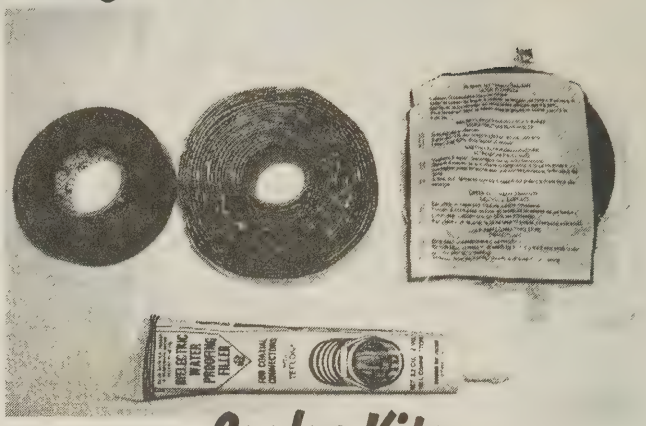
Consider extra RFI cores, jumpers and Line Isolators[tm] for emergency situations.



Disconnects & Extensions

PCLI's (Power & Control Line Isolators) are installed in series with a power or control line. Thus, you need to either wire the PCLI directly into the circuit or use connectors to install in a circuit. For example, a #10, 14 foot extension may be cut and used to connect a piece of equipment to your power source and mate with the PCLI-2. The cut end and its connector will then be used to mate with the opposite end of the PCLI to connect with the radio's power cable.

The 14-foot version is also perfect for mobile radio installations. #10 wire will handle 20 amps. #10 x 4 foot versions are cut in two for installation directly in an existing power line.



Sealer Kits

All cables used outside in the weather MUST be properly sealed. The procedure I prefer is shown elsewhere in this catalog. Here is a kit of everything you'll need to seal a couple of dozen RF or power & control connectors.

Contains -
1 roll of 3/4" x 60' black electrical tape
1 roll of 3/4" x 30' black cold shrink tape
1 roll of ½" x 12' Coax-Seal
1 tube of STUF **$16.50**

Disconnects & Extensions

The 4-pin connector is for use with the PCLI-4 and the 8-pin version, with the PCLI-8. The 8-pin version is also perfect as a disconnect for antenna rotators.

2-Pin #10 Bullet Connectors

14 foot length, mates with PCLI-2 **$9.95**

4 foot length, mates with PCLI-2. Cut in two and use connectors to splice into existing 12 volt power lines. **$5.95**

4-Pin #16 Bullet Connector

One foot length with mating male and female connectors For splicing a PCLI-4 into a 4-wire cable. **$4.95**

8-Pin Bullet Connector

One foot length with mating male and female connectors. Use as a rotator disconnect. **$8.95**

Coax & Connector Weatherproofing

Sealing coaxial connectors and other antenna components is a multi step operation. As shown on the next page, connectors are sealed from the inside and the outside. ***STUF™***, ***Coax-Seal™***, ***Cold-shrink tape***, and quality ***electrical tape*** are all used to ensure lasting and reliable weatherproofing. When all products are applied properly, you should enjoy years of trouble-free service. Such confidence in the long term performance of your antenna system is well worth the slight extra effort.

Coax-Seal™

CoaxSeal® is your first line of defense in your coax cable's war against the ruinous effects of the weather. CoaxSeal® is a hand-moldable, plastic mastic, suitable for sealing a wide variety of materials, metals, plastics, and vinyls to accomplish a tenacious and waterproof, long-lasting seal for coaxial cable.

CoaxSeal® is black, tacky, non-conductive, non-contaminating, 100% waterproof, and has low vapor transmission rate. It has self-healing qualities.

#101	**Pack**	**½" x 10"**	**75¢**
#104	**Roll**	**½" x 5'**	**$ 2.50**
#105	**Roll**	**½" x 12'**	**$ 5.00**
#105	**Box = 4 rolls**		**$16.95**
#106	**Roll**	**1" x 12'**	**$ 6.50**
#106	**Box = 4 rolls**		**$21.95**

STUF

This a viscous white compound with dielectric properties that exceed those of the connectors to which it is applied. Forces moisture out of the connector from the inside during assembly.

One tube will fill several connectors.

Tube contains a volume of 3.2 cubic inches - enough for a couple of dozen PL-259's

$5 per tube

Cold Shrink Tape

- ✔ Ideal moisture barrier
- ✔ Resists sunlight
- ✔ Long-term protection
- ✔ No heat needed, just wrap

This is a preferred way to seal connectors in Europe. I use it too!

Cold Shrink tape is wrapped around the connector with a slight stretch. After a few hours, the tape shrinks and forms a solid weatherproof seal. I like to use Cold Shrink tape over a layer of Coax-Seal as you will see on the next page.

3/4" x 30' roll **$6.50**

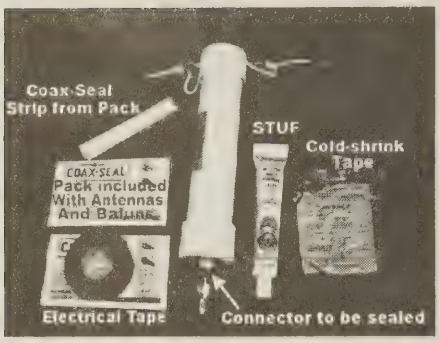
Electrical Tape

A high quality, black 3/4" electrical tape in 60 foot rolls of better quality than usual hardware store variety.

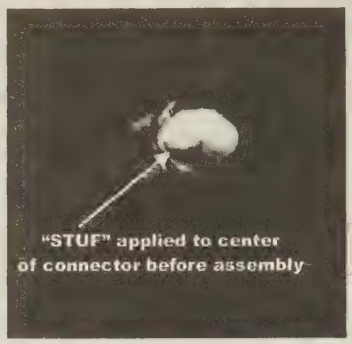
Only **95¢** per 60' roll

$8 pack of 10 rolls

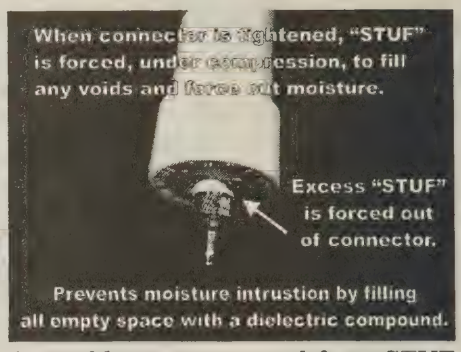
Sealing a Coaxial Connector



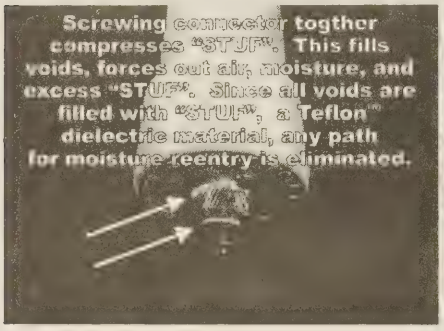
You need Coax-Seal, STUF, Cold-shrink and electrical tape.



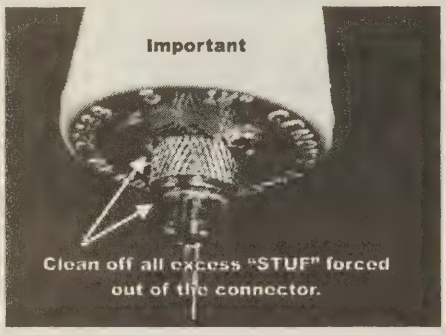
Apply STUFF


When connector is tightened, "STUF"
is forced, under compression, to fill
any voids and force out moisture.
Excess "STUF"
is forced out
of connector.
Prevents moisture intrustion by filling
all empty space with a dielectric compound.

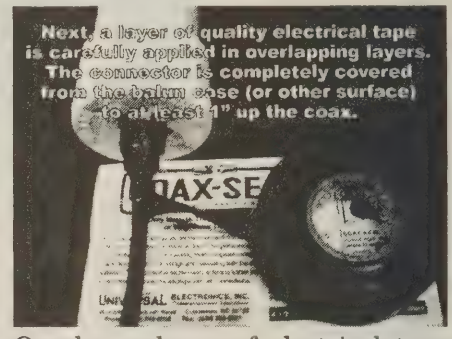
Assemble connector and force STUF out of the connector.


Screwing connector togther
compresses "STUF". This fills
voids, forces out air, moisture, and
excess "STUF". Since all voids are
filled with "STUF", a Teflon
dielectric material, any path
for moisture reentry is eliminated.

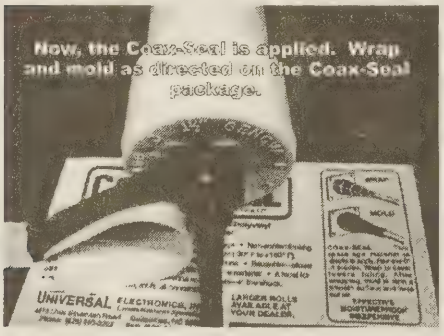
Compression causes STUF to fill all voids inside the connector.



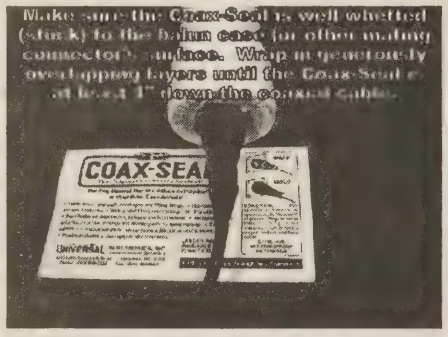
Important
Clean off excess STUF


Next, a layer of quality electrical tape
is carefully applied in overlapping layers.
The connector is completely covered
from the balun case (or other surface)
to at least 1" up the coax.

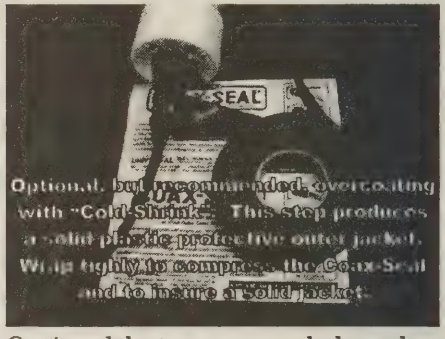
Overlap a layer of electrical tape from body of the device and continue well onto the cable.



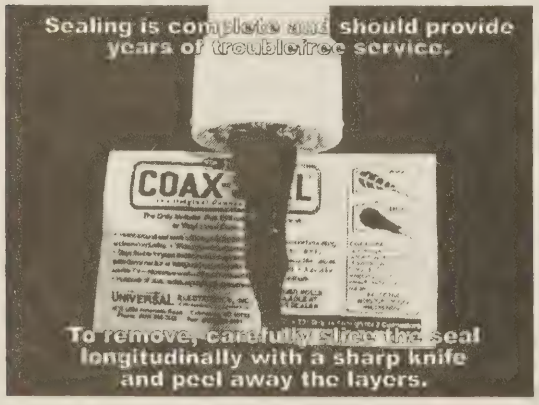
Apply one overlapping layer of Coax-Seal. Press onto device and cover at least 1" of cable. The seal must be solid from device to cable.


Make sure the Coax-Seal is well whetted
(stuck) to the balun case (or other mating
connector) surface. Wrap in generously
overlapping layers until the Coax-Seal is
at least 1" down the coaxial cable.
COAX-SEAL

IMPORTANT - Make sure the Coax-Seal is well whetted (stuck) to the device as well as to the cable.


Optional, but recommended, overcoating
with "Cold-Shrink". This step produces
a solid plastic protective outer jacket.
Wrap tightly to compress the Coax-Seal
and to insure a solid jacket.

Optional, but recommended, apply a layer of Cold-shrink tape completely over the Coax-Seal.


Sealing is complete and should provide
years of troublefree service.
To remove, carefully slice the seal
longitudinally with a sharp knife
and peel away the layers.

The finished product. You should enjoy years of trouble-free service from this connection.

STUF seals from the inside

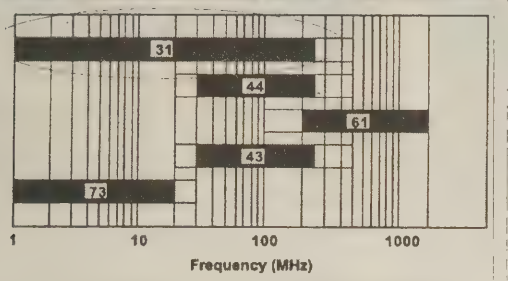
Electrical tape makes removal of Coax-Seal easier.

Coax-Seal forms a totally waterproof seal

Cold-Shrink tape provides a tough, solid outer layer which puts a squeezing force on the Coax-Seal to improve the seal. It provides an extra layer of protection.

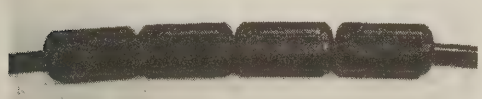
RFI Quick Fix™ Headquarters

A new RFI bead eliminates all others.



Up to this point, nearly all RFI beads were made with #73 material. As you can see from the chart above, it was useful from 1 through about 25 MHz. To cover the frequencies up to 300 MHz you would have to switch to #43 material. Now, at the RADIO WORKS, our new RFI "core," which repaces about 6 beads, covers the spectrum from below 1 MHz all the way up to 300 MHz. Just as important, the impedance of the new bead is higher than previous types.

Use one or more beads



Beads are now available in two sizes with inside diameters with .25" and .5". Both use the same new #31 ferrite material available to you now from the RADIO WORKS. Use the MFJ-805 to find the wires and cables carrying unwanted stray RF in and out of your shack and equipment. Then use either the MFJ-701 "break apart" toroid cores or use our new and highly effective RFI cores.

These cores have "snap-together" baskets which securely hold the core halves together. Combine these with our famous Line Isolators, and you have the latest weapons for the fight against RFI.

1/4" RFI Core - $2 fits RG-8X, RG-59, and any 1/4" cables including smaller power and rotator cables.

1/2" RFI Core - $4 fits RG-8, RG-213, 9913 and any standard size coax and most rotator cables.

MFJ-805 $75

Pocket-sized RFI Detector Track down and eliminate RFI caused by radiating cables and coax. • If you don't know where the problem is coming from, you can't effectively eliminate the problem. Adjustable over a 50 dB range.

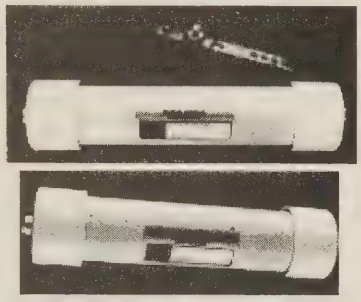
If you have RFI problems, you need the MFJ-805. It makes finding offending RFI easy. Once you find the problem, you can apply the remedy.

Line Noise Solutions

MFJ-1026 $169.95

Too many features to list but this unit can null line interference by 60 dB. Wipes out all types of noise, and it's more effective than a noise blanker. I can endorse these because there's one in my shack. Works on all modes from 1.5 MHz - 30 MHz

Use to null out unwanted station to reveal hidden DX. Definitely improves weak signal reception when line and appliance noise is a problem. Order one now!



The RADIO WORKS

Line Isolators

The original RFI "Quick Fix." Our Line Isolators has solved RFI that have eluded solution for years. Users report instant and complete elimination of RFI problems. Combine the Line Isolators with our new RFI "snap-togehter" ferrite cores and the MFJ toroids, and you will have the best weapons possible on the RFI battleground.

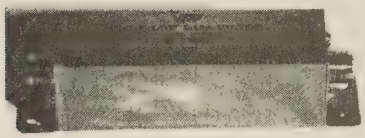
We have all the grounding supplies you need to insure a proper RF ground at your station. This is first step in RFI protection.

MFJ-701 RFI-free Choke Kit

Pack of 4 cores $14.95

Use is similar to our Ferrite cores. These toroids are useful for control cables and power wires. Also works with small diameter coax like RG-58 and RG-8X. Eliminate RFI from .5 MHz to 200 MHz. These snap-apart toroides are effective because you can wrap several turns of wire on each core.

TVI & RFI Suppression



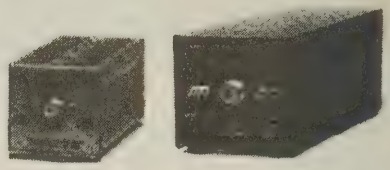
MFJ-702 $24.95

Low Pass Filter
Reduces harmonics by 50 dB. Handles 200 watts. Perfect for transceivers. It's the low power version of the MFJ-704.

MFJ-931 Artificial RF Ground

$79.95

Creating an artificial RF ground effectively places your rig near actual earth ground potential even if your rig is on the second floor or higher where no earth ground is possible. Reduces chances of TVI/RFI. The MFJ-931 creates an artificial RF ground. It resonates a random length of wire thrown along the floor and produces a tuned counterpoise. When used with a conventional ground system, the MFJ-931 places a far away RF ground directly at your rig -- no matter how far away it is. It reduces the electrical length of the ground connection wire to virtually zero by tuning out its reactance. Tune with the built-in RF ammeter. 1.8 - 30 MHz.



MFJ-264 $59.95 MFJ-260C $31.95

DUMMY LOADS

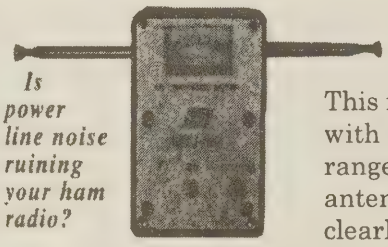
MFJ-264 - 50 0hm, 1500 watts for 10 seconds, 100 w continuously. 1.8 - 650 MHz. SWR < 1.3:1 @ 650 MHz. Dry, air cooled.

MFJ-260B - 300 watt, air cooled, non-inductive resistor. Full load for 30 seconds, derated curve to 5 minutes. SWR < 1.5:1 @ 150 MHz, < 1.1:1 @ 30 MHz.

MFJ-704 Low Pass Filter

Passband -	1.8 - 30 MHz
Cutoff frequency	40 MHz
Power capacity	1500 w
Impedance	52 ohms

$44.95



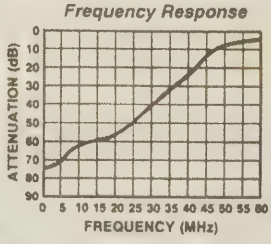
Must Have!

Find Power Line Noise Fast

MFJ-852 $89.95

This is a sensitive 135 MHz superhet AM receiver with a noise field strength meter with an AGC range of 70 dB. The telescopic, direction-finding antenna is balun isolated and optimized. The clearly defined null accurately pinpoints the noise source easily.

High Pass TVI Filter



MFJ-711 $21.95

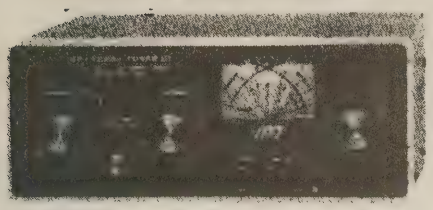
Passband	52 - 550 MHz
Attenuation:	> 40 dB @ 30 MHz
Impedance:	75 ohm unbalanced or 300 ohms balanced
Insertion Loss:	< .5 dB at 52 - 550 MHz

The MFJ-711 can drastically reduce or eliminate most TV interference coming from nearby radio transmitters.

Install between your cable and VCR or TV set. Reduces signal received from transmitters operating below 30 MHz.

An MFJ exclusive shield-braking circuit prevents your antenna cable from acting like an HF antenna, thereby reducing or eliminating the chance of harmful TVI interference.

MFJ Tuners



MFJ-962D $239

Rated 1500 watts PEP Input
800 watts PEP Output
Switch selected wide range inductor
Peak and average reading cross-needle
New, more accurate directional coupler
6 position ceramic antenna switch
2 coax lines (direct or through tuner)
Random wire and balanced output
4:1 current balun
Meter uses 12 VDC or MFJ-1312B, $14.95

MFJ-986 $295

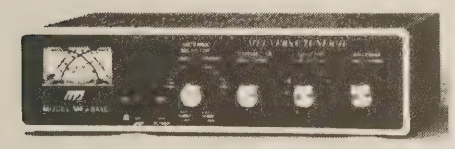
Differential-T Circuit
Rated 3000 watts PEP Input Power
1500 watts PEP Output Power
Roller inductor, 3-digit turns counter
Peak and average reading cross-needle
New, more accurate directional coupler
6 position ceramic antenna switch
2 coax lines (direct or through tuner)
Random wire and balanced output
Current balun
Meter uses 12 VDC or MFJ-1312B, $14.95

MFJ-969 $179

Roller Inductor 160 - 6 m
All of the features of the MFJ-949E, plus MFJ's superb AirCore™ roller inductor.

300 watts PEP
Full 160 to 6 meter coverage
Match nearly antenna
8 position antenna switch

Meter uses 12 VDC or MFJ-1312B, $14.95

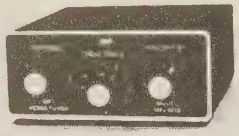


MFJ-949E $134.95

Rated 300 watts
Build-in 300 watt dummy load
Peak and average reading cross-needle
Selectable 300/30 watt meter ranges
8 position ceramic antenna switch
2 coax lines (direct or through tuner)
Random wire and balanced output
4:1 balun for balanced lines
Meter uses 12 VDC or MFJ-1312B, $14.95

MFJ-941E $105

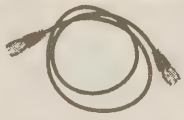
Rated 300 watts
Selectable 300/30 watt meter ranges
8 position ceramic antenna switch
2 coax lines (direct or through tuner)
Random wire and balanced output
4:1 balun for balanced lines
Meter uses 12 VDC or MFJ-1312B, $14.95



MFJ-901B $72.95

Rated 200 watts PEP
Small size, 5" x 2.5" x 6"
4:1 balun for balanced lines

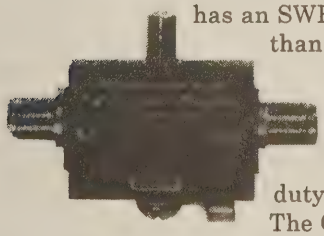
We always have the latest MFJ models.



Remember to order jumpers to interconnect equipment.

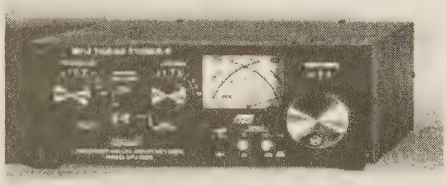
MFJ-270U GUARDIAN ANGEL™
$29.95 Lightning Surge Protector

Ultra-fast gas discharge tube safely shunts up to 5000 amps of peak impulse current harmlessly to an independent ground connection. It has an SWR of less than 1.1:1 and an insertion loss of less than 0.1 dB. It can be used up to 1000 MHz (I wouldn't go much above 2 meters since this unit uses SO-239 connectors - Jim).



The Guardian Angel™ is made of heavy duty steel with quality connectors and components. The Gas discharge tube is replaceable.

As with all lightning surge protectors, the Guardian Angel™ will not protect against a direct lightning hit!



MFJ-989C $325

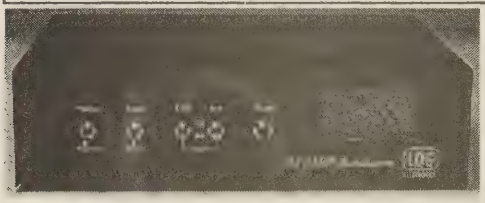
MFJ's BIG Tuner
3 KW PEP SSB input
1.5 KW PEP SSB output
Super heavy duty components
Massive transmitting capacitors
"AirCore Roller Inductor
True Current Balun
Built-in Dummy Load
Lexan Front Panel

Meter uses 12 VDC or MFJ-1312B, $14.95

LDG Automatic Tuners & Accessories

I am excited to present the LDG line of automatic tuners. They are perfect for use with any of our antenna systems, and they are RF sensed so that they will work with any rig including the classic Collins and Drake rigs. They are the perfect solution to the limited tuning rang of the autotuners built into many of today's rigs. They will tune dipoles, verticals, beams, or most any other coax fed antenna. ***They are especially well suited for tuning CAROLINA WINDOMS and SuperLoops on all available bands.*** Optional remote heads are available for either the RT-11 or the AT-11MP for maximum convenience and flexibility. Remote heads permits manual fine tuning. AT-11MP has manual controls on the front panel.

These are our tuners of choice for the CAROLINA WINDOM^{tm} and SuperLoop^{tm}



AT-11MP $219 assembled

Switched L-network
6 - 800 ohm loads
Microprocessor controlled
Configuration: Switched-L network
Tuning time: 0.1 - 5 seconds, 3 second average
Remote control head option
Connectors: SO-239 in and out, Icom control
Power: 11 - 15 V, 15 - 500 ma. (250 ma. average)
1.8 - 30 MHz
Dual Cross-needle meter
Power range: 5-150 w
9.5" x 8.25" x 2.5"

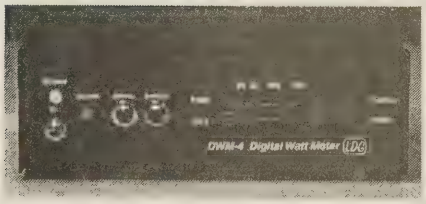
Z-11 $169 Assembled

QRP version of the RT-11. Features latching relays that draw no power after tuning.
1.8-30 MHz
Autosleep mode
Tuning time 0.1 - 3 seconds (1.5 sec average)
Connectors: SO-239 in and out
Power: 11 - 15 V 10-190 ma. 75 ma. average.
Zero current drawn once tuned.
6 - 800 ohm loads
LED SWR & status indicators

RT-11 $199

Remote autotuner. Compact design is water resistant high impact ABS plastic enclosure. Easily installed in marine, RV, and tower mount installations. ICOM compatible. Works with any rig.

1.8-54 MHz
50 MHz specs: 3:1 SWR, 50 w output
6-800 ohm loads
Optional Remote Control head
8.5" x 5.5" x 3"
2.5 pounds
Power range: 5 -125 watts*
* 100 watts continuous
Tuning time: .1-5 sec (w sec av)
Flange mounting bracket
Power: 11 - 14 V 7-250 ma
20 ma average.



DWM-4 Digital Wattmeter $120

Additional sensors $25 each
HF/QRP, 2 kW HF,or VHF/UHF

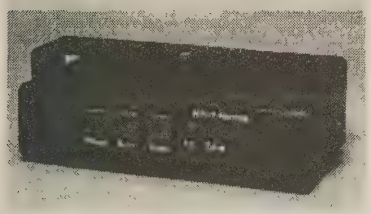
Based on July 1999 QST article. This wattmeter is a microprocessor controlled, multi-sensor power monitoring system that covers, HF, VHF, and UHF. A multifunction display allows full control of the meter's menu system. Up to four remote sensors can be connected to the monitor. Each is individually selected with a front panel switch Comes with a mounting bracket for mounting under a shelf. Your call sign is easily programmed into the display, and alarms are fully setable. Comes with two sensors, calibrated to your choice of 3 frequency ranges, HF, HF (QRP) HF (high power) , VHF, or UHF. SWR alarms warn when SWR exceeds your preset values.

I will definitely have one of these in my new high tech shack! (Jim)

LDG Accessories

Remote Head for the AT-11MP $39 assembled

Interconnects with tuner using a DB-9 cable and permits auto or manual tuning of the AT-11MP. Has two indicator LEDs to indicate tuning or that the SWR is 1.5:1 or below. 3.5" x 3.5" x 2.5"



Remote Head for the RT-11 $39 assembled

Simple control and simple mounting makes this ideal for mobile operation, RV, marine and similar installations.

Coming Soon! LDG 750 Watt Automatic Tuner

"Announce and Pounce™" is now possible at a reasonable price. This new automatic tuner is going to change everything in the DX game, at least it will around my shack. You see, I'm using a conventional linear and a manual antenna tuner, just like almost everyone else. When a DX "spot" is announced on a DX internet site, it takes me several minutes to change bands on my linear, and then re-tune both my linear and antenna tuner. While I'm not abandoning this setup on my high power station, I am putting a second transceiver, linear and tuner that will be able to change bands and tune up on a new frequency in less than five seconds. My ***"Announce and Pounce"*** station will consist of an ICOM 756 PRO under computer control and an Ameritron ALS-600, 600 watt solid state, no-tune amp. I've been waiting for the new LDG 750 watts automatic tuner to hit the market to complete the station. I'm really excited about the possibilities and convenience. We'll have the new tuners in stock as soon as they are available, but I get the first one!

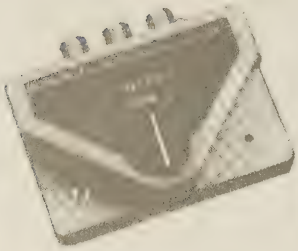
This is the perfect tuner for anyone running middle power rigs like the Ameritron ALS-500M, ALS-600 solid state linears, and the AL-811 or any other linear in the under 750 watt power level. That includes the fabulous Collins 30L-1 if you don't push the power. The new tuner will be similar to the AT-11MP, only bigger.

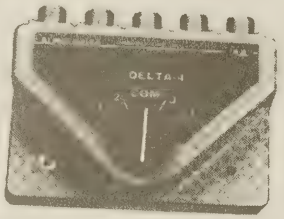
Now for the really good news! This and all LDG tuners work perfectly with our CAROLINA WINDOMS and SuperLoops. For the first time, you can have a reasonably priced, WIDE RANGE, automatic tuner for middle power linears. Price for the 750 watt version is likely to be between $500 and $600.

Since these tuners are compatible with our antennas, we plan to carry most of the LDG products as they become available. Check our web site for breaking news.

Power Cube supply for MP, AT-11, Z-11, BWM-4, RVS-8 12 VDC $10
AT-11 and AT-11MP interface cable for ICOM $5

Coax Switches





Alpha Delta Coaxial Switches

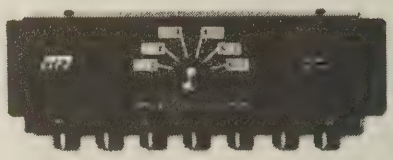
Delta-2 $49.95 Delta-4 $79.95

Surge Suppressor built-in

Alpha Delta switches are true "cavity" types which maintain their 50 ohm impedance up to 450 MHz. Switch and surge suppressor cartridge are rated at 1500 watts. All unselected positions are shorted and a common position places a short across all connectors.

Delta-2 & Delta-4 Specs with SO-239 connectors

Frequency	VSWR	dB Loss	Db Isolation
30 MHz	<1.1:1	.1 dB	> 60 dB
150 MHz	1.3:1	.15 dB	> 50 dB
450 MHz	1.4:1	0.5 dB	50 dB



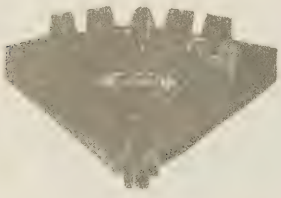
MFJ-1701 $45

Six position
50 or 75 ohms loads
2 KW PEP, 1 KW CW

Transi-Trap

ATT3G50 $49.95
ATT3G50HP $49.95

Lowest loss broadband design. Good to 500 MHz. UHF connectors.
ATT3G50 rated 200 watts
ATT3G50HP rated 2KW



MFJ-1704 $58.95

Lightning/surge protection device
4 Position, center off
All unused connectors shorted
2.5 KW PEP 1 KW CW
Isolation > 50 dB @ 500 MHz
Extremely low insertion loss
50 Ohm

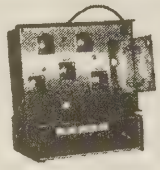
MFJ-1702C $22.95

2 position, center off
Unused connectors shorted
Cavity construction.
2.5 KW PEP, 1 KW CW
Insertion loss < .2 dB
Isolation > 50 dB @ 450 MHz
50 Ohm

Remote Antenna Switches

Ameritron RSC-4 $125

Switches four antennas. Control voltage is sent through the coax. 1.8 - 30 MHz, 1500 watts average.



Ameritron RCS-8V $135

Switches five antennas. Needs 6 wire control cable. DC to 250 MHz. 5 kW below 30 MHz, 1.5 kW @ 150 MHz

Protect your valuable receivers and transceivers! Transi-Traps have a gas-discharge device that fires when the input voltage rises above a predetermined point. The 200 watt models fire at the lowest voltage. For maximum safety, I suggest that two Transi-traps be used; one between the transmitter and linear and one on the output side of the linear. Receivers should be protected with a ATT3G50. The ATT3G50HP is use after a linear amplifier.

More Recommended MFJ Prouducts

$57.95

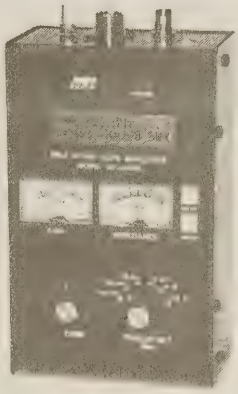
MFJ-914 AutoTuner Extender

1.8 - 30 MHz	300 Watts
7 Load positions	Connector for dummy load
Ground and bypass	Separate ground terminal

The automatic antenna tuners built into transceivers have a very limited tuning range. The MFJ-914 solves that problem and puts nearly any coax-fed antenna within the tuning range of your automatic tuner.

With this unit, you do not need a manual tuner for a CAROLINA WINDOM, SuperLoop or G5RV. Just select the proper setting on the "914" and your autotuner does the rest.

MFJ-259B
Digital Analyzer



1.8 - 170 MHz

LCD readout and m provide valuable antenna para Frequency, SWR, comple impedance (resistance magnitude and phase coax cable length and distance t return loss, reflection inductance, capacitance, readin much more are all possible with "259B." It's essentially generator, counter, impedan and VSWR meter all rolled very useful instrument

Only $232.95

Jim's Note: This is a valuable instrument and it is highly recommended. However, caution is in order. You must pay careful attention to the manual and understand wh you are measuring in order to avoid errors. Antennas a feedlines are complex and errors are common when t and similar instruments are used by those not experienced with RF measurements. It's not the faul of the instrument. Accurate results require understanding and carefully applied technique

MFJ-854 RF Current Meter

Accurately measures true RF current in antenna elements, radials, groug wire, and on coa feedlines... ***Track down RFI-causing current on household wiring and cables***
Measures true RF current 30 ma - 3 Amps in 6 ranges. The sixth range features variable sensetivity which is very useful when tracking down RFI problems. The nice thing about thi instrument is the ability to accurately measure changes as you improve your st add Line Isolators, Power & Control Line Isolators and ferrite cores. It a ½" in diameter (RG-213, 9913, SuperCable, etc.)

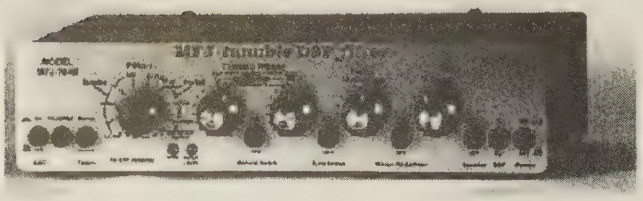
Features

Linearity compensation circuitry.
Widerange: 1 ma to 3 amps
Full HF Coverage: 1 MHz to 30 MHz and beyond
Long batttery life. 2.5" wide x 5 ½" H 1 ½ " deep.

$92.95

MFJ-212 $75 **Tune up your antenna tuner without transmitting!**
your tuner for a 1:1 SWR - no additional tweaking needed. Don't put RF on tune up. Handles up to 300 watts and bypasses itself to prevent damage. W radios on 160 - 10 meters. Needs 9-12 volts or MFJ-1312B power supply ($

"You Can't Work Them, If You Can't Hear Them!"



MFJ-784B $229.95

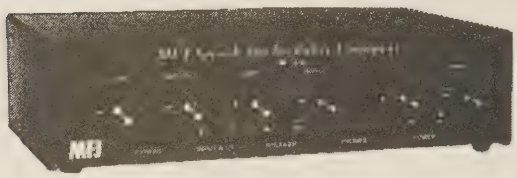
Requires +12 V DC or MFJ-1315 ($15)

- ✓Tunable Spotting Tone - accurately tunes even when using the narrow bandwidths.
- ✓ Adaptive Tuning - tuning slows down as bandwidth narrows
- ✓ Improved automatic notch- variable aggressiveness
- ✓ Speaker On/Off - phones always active
- ✓ FilterTalk - send exact filter settings in CW
- ✓ Filter automatically bypasses during transmit for monitoring side- tone, voice or data by sensing PTT line.
- ✓Improved manual notch for CW
- ✓Manual and automatic notch can be used together.

After you've got a rock crusher signal and you're working on knock-your-socks-off transmitted audio, you've got to be able to hear the stations calling you. There's nothing like a good external DSP to help pull out signals covered up in the noise or QRM. Sure, most rigs have built-in DSP, both of my main rigs do, but the extra flexibility and functionality of the external DSP makes all the difference in hearing a faint whisper of a signal or just make a quiet QSO a bit more comfortable. If you're not using DSP, you've just got try it. When was the last time you copied a CW signal below the noise level? With DSP, you can.

There are many DSP units on the market, but I believe that the MFJ-248B represents the best value. You get every conceivable feature. Even computer sound-card models can't keep up with this.

My personal endorsement is that I use three of them. One each on the main and sub receives of my FT-1000MP and the third following my IC-756 Pro. It really does make a difference even with the '756 PRO which already has the best DSP system around.



MFJ-616 $159.95

MFJ-1316 12 VDC @ 1.5 A power supply $19.95.

Features

There are four overlapping bands at 300, 600, 1200, 2400 Hz. Cut or boost is 20 dB. The unit is immune to RFI. There's a front panel phone jack, speaker on/off switch, two selectable transceiver inputs and a bypass switch.

The mono input is split into two output channels with a balance control. Each output channel has its own 2.5 watt amplifier. If you hear better in one ear than the other, you can compensate for the difference and thus further improve intelligibility. You'll be surprised with the level of improvement this equalizer can provide. The results are simply amazing.

You can use this unit in combination with the MFJ-259B DSP and a Heil ProSet.

Haven't you ever wished you could tailor your receiver's audio to your personal taste? Wouldn't it be nice to add a little more lower midrange or cut the treble a bit to reduce hiss or other noise? Well, that's what an audio equalizer does and this unit is a quality audio equalizer that covers the voice frequencies.

Years ago I did a lot of research in the area of speech intelligibility and speech processing. In fact, I built several split-band processors and speech energy concentration devices. It was an interesting time, as I was running a speaker evaluation lab and had just the right gear available for this project. Nothing ham related ever came of this project, but the speaker and sound reproduction lab has given me a lifelong appreciation for good sound quality reproduction. When I get on the subject, though, I'm sometimes told I'm a bit too critical. Anyway, I'm glad to see important researchers like Bob Heil making a significant impact on the lousy audio we've endured on the air. Let's face it, there's more to speech intelligibility than just cranking up the speech process to the point people complain, and then just crank it up a tiny bit more. MFJ is doing a good job helping us on the receive end with their DSP and Speech Intelligibility Enhancer[tm].

If I remember correctly, there are three frequency ranges important to speech recognition. These are called "formants." The most important frequencies are in the 1200 Hz and 2100 Hz range. It is at these frequencies that maximum speech recognition is conveyed. It's necessary to add some energy in the area around 500- 600 Hz to add naturalness, but there is little to be gained by adding frequencies below 500 Hz.

Let's consider sound energy verses intelligibility. From MFJ's literature we see that frequencies from 500 to 4000 Hz contribute 83% to word intelligibility. Frequencies from 500 to 1000 Hz contribute 35% to word intelligibility and require 35% of the sound energy. Frequencies from 1000 Hz to 4000 Hz contribute 48% if intelligibility by has only 4% of the sound energy! In contrast, frequencies from 125 Hz to 500 Hz requires 55% of the sound energy and contribute only 4% to word intelligibility.

The importance of this is that the frequencies from 1000 Hz to 4000 Hz provide 48% of intelligibility but requires only 4% of the sound energy. On the other hand, frequencies below 500 Hz consume most of the sound energy but contribute very little to intelligibility.

Step II in Making a Big Signal

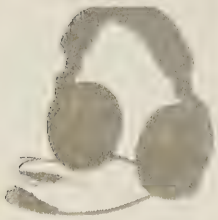
We have been concentrating on improving your radiated signals. I don't plan to stop. I have a couple of projects in the works that look exciting. However, it's hard to improve on the spectacular signals our incredible CAROLINA WINDOMS and SuperLoops are producing. Your signal is getting the respect you deserve on the bands. So, how do we improve on that? It's simple. It's called "audio punch." We've all heard signals that punch through the QRM and others that just sit there in the noise and crud. Both signals may be the same strength on the S-meter, but one station draws attention to itself while the other is ignored. So, now that you've got a great signal with your CAROLINA WINDOM or SuperLoop, you've completed the first and most important step. Now, we've got to give your signal all the "punch" we can muster. Think about it this way, when you replaced your dipole with a CAROLINA WINDOM or a SuperLoop, it was like adding a linear amplifier. Now, combining our antennas with real audio punch and you have a "knock-your-socks-off" signal. Add a linear amplifier to that, and you get admission to the game the big boys play, the place where most everyone else is just a kibitzer.

There are any number of reasons for soft or distorted audio. The unfortunate truth is that some rigs and a lot of operators simply sound bad on the air. Sometimes the problem is misadjusted equipment - speech processors cranked up excessively so that the voice is artificial and distorted, filled will all sorts of background noise. Sometimes, it's poorly selected accessories, like microphones that simply don't sound good. And, it doesn't have all that much to do with how much you pay for the microphone. It's a case of application. One example comes to mind. I perform on stage a lot with my musical interests. I have a favorite stage microphone that I think gives my voice just the sound I want in a performance. That same microphone, with all of its performance attributes, doesn't sound all that good when plugged into one of my rigs. A completely different sound is needed on the air than on the stage. Turn it around. Do you think I could get away with the audio of a typical transceiver, even a high bucks model, when I'm on stage? Not unless I want to sound like Bob Dylan. (Just kidding, I hope you Dylan fans can forgive me)

In ham radio, it's a quest to make ourselves heard over the competition, without sounding obnoxious. It's like a yelling match, but in this case yelling is the worst thing to do. It's all about articulation, peak-to-average ratios, formants, and a dozen other factors. In this arena, there is only one player, in my opinion. It's Bob Heil of Heil sound. I have been using his products for years. You may be, too. If not, I want to encourage you to give the products on the following pages careful thought. With a properly selected Heil microphone (and I'll tell you my favorites), you'll have a better on-the-air presence. You'll sound louder. You'll sound better. You'll get noticed. More DX will respond to your calls, and the CAROLINA WINDOM will get lots of the credit. I'll sell more antennas. A bit circular isn't it. True enough, but if you've read my publications over the years, you know that my entire focus is on radiating the biggest signal possible for the fewest possible dollars. And, now you have all the pieces. It's up to you to take advantage of them.

Sound Good and Make Yourself Heard.

HEIL SOUND



Rugged, lightweight, comfortable headset
Fully flexible boom swivels up for travel or storage.
The ear pads are heavily stuffed
The pads cover the entire ear and seal out noise
Pads are removable for washing. Pads are replaceable.
Works in VOX and PTT modes
Mic placement is virtually unlimited
1/4" stereo plug and 1/8" transmit audio plug

PRO-SET 4 with HC-4 mic $125

PRO-SET 5 with HC-5 mic $125

PRO-SET-IC with the new FET Electret element for ICOM radios, with special AD-1-IC adapter **$145**

Requires AD-1 Adaptor

AD-1-K Kenwood	$17
AD-1-Y Yaesu	$17
AD-1-I Icom	$17

PRO-SET - This is the Boom-mic headset that I use. In fact I have several of them for my various operating positions. I personally prefer the PRO-SET 5 with its HC-5 microphone. The HC-5 element has a pleasant sound while providing very crisp, clear easy to understand audio. It's the best choice for all around use and works well with RF speech processing. When I feel I need more punch, for busting pileups and such, I just crank up the RF processor and select an appropriate audio equalization in the rig. However, if DX'ing is your focus, you may want the HC-4 mic with its highly penetrating sound quality.

Hand Switch - I use the HS-1 as well as VOX to key the rig. I find foot switches too confining, and VOX permits unwanted sounds to key the rig causing QRM. I do use VOX for quick exchanges, but for armchair QSO's, I like the hand switch. It leaves my right hand free for logging, left hand for keying and the mic is on the headset boom. This is so convenient that I cold operate from my easy chair.

BM-10 - The original Heil headset returns. It's a lightweight (8 oz.), soft and comfortable headset for prolonged use. Does not cover the ear so that you can hear background sound. 1/4" stereo plug and 1/8" transmit audio plug. Requires Ad-1 adaptor.

BM-10-4 with HC-4 mic $85

BM-10-5 with HC-5 mic $85

BM-10-IC with the new FET Electret element for ICOM radios, with special AD-1-IC adaptor **$100**

HS-706 specifically for IC-706 only. Single padded earpiece. Adjustable headband for left or right mic. Fully adjustable boom. Non-latching PTT lapel clip. High gain electret mic. Plugs directly into IC-706 modular plug. **$59**

HM-10
Upgraded, new body
Light-touch PTT
PTT or VOX use
XLR connector
"Dual" configuration provides either HC-4 or HC-5 cartridge. Comes with carrying case and boom clip. For hand, boom or desk use.
Requires CC-1 cable

HM-10-4 with HC-4 element **$65**
HM-10-5 with HC-5 element **$65**
HM-10 Dual with both HC-4 & HC-5 **$110**

Goldline Microphone
- Dual cartridge. Smooth full range and either HC-4 or HC-5 cartridge.
- "Light Touch" PTT switch
- Gorgeous new high gloss finish
- Goldline Vintage for tube rigs
- Terminates into a professional audio 4-pin XLR connector.
- 1 mfd non-polar decoupling cap installed for ICOM use.
- Can be used with SM-1 shock mount
- Requires CC-1 connecting cable

☐ Goldline GM-4 with HC-4 **$140**

☐ GM-5 with HC-5 mic **$140**

☐ Vintage mic with hi-z wide range mic only for Collins, Drake, etc. **$160**

HM-I for ICOM radios. Wide-narrow response switch. Electret element drives ICOM rigs properly to take full advantage of DSP transmit audio. Use with any Heil stand or boom mount. In Gold Line body. ***Requires CC-1-I adaptor.*** **$95**

HC Microphone Elements
HC-4 "DX Dream Machine"
HC-5 "The Key Element"
Cardoid pattern
Use in any mic housing

$30 each, either model

Arcurate audio starts at the microphone, not the DSP circuit. If the mic doesn't sound good, your rig won't sound good - period. These are the same cartridges used in the various Heil mics. Either cartridge rolls off at 12 dB per octave at high and low end.
HC-4 The DX mic. 500 Hz - 3800 Hz with a 10 dB rise 2 KHz. This produces a crisp, piercing sound for punching through pileups.

HC-5 For ragchewing and contesting. It's my preferred mic. unless I can switch between elements. 350 to 4000 Hz. 6 dB rise at 2000 Hz.

HMM Hand Mics. Dual element, heavy duty. Has a new full-range element and a switch selectable HC-4 "DX" element. Commercial quality case and coiled cable terminated with an 8-pin plug for Kenwood (HMM-K) or Yaesu (HMM-Y). ***$78*** Yaesu modular requires AD-100-8 adaptor **($25).**

HMM ic for ICOM has a single, special electret condenser mic. ***$58***

Notes on Accessories

Heil headsets and microphones are designed to be used with appropriate adaptors to match your transceiver. Headsets require an AD-1 which terminates into standard connectors for your radio. This adaptor also has a 1/8" socket for use with external PTT control like the HS-1 and FS-1 switches. The CC-1 is for use with the studio style mics and is available for the major brands using 8-pin plugs. ICOM rigs require special adaptors like the ADM-706.

All Heil Boomsets require appropriate adapters to mate them to your

AD-1-K (Red) Kenwood	$17
AD-1-I (Blue) Icom	$17
AD-1-Y (Yellow) Yaesu	$17
AD–T (Black) Ten-Tec	$17
AD-1-C (While) Collins	$20
AD-1-D (Purple) Drake	$17

CC-1 Connecting Cables

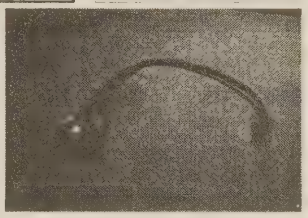
All Heil Microphones require the appropriate adapter to mate them to your particular model transceiver.

CC-1 series adapters are available in 4-pin, 8-pin, and modular styles. When ordering an modular style, place an "M" behind the last character (i.e. CC-1-Y-M). Specify your exact needs when ordering (Kenwood 4-pin, ICOM 8-pin, etc.).

CC-1-K Red Kenwood	$30	CC-1-I Blue ICOM	$30
CC-1-T Black Ten-Tec	$30	CC-1-Y Yellow Yaesu	$30
CC-1-C While Collins	$33	CC-1-D Purple Drake	$30
XLR 4-pin plug only	$6		

ADM-706 $25

Converts modular input of the '706 to standard 8-pin Foster plug will mate with Heil Icom microphones or headsets. The ADM-706 brings only the audio, audio shield, push-to-talk and push-to-talk ground out. There is no connector for + voltage or up and down control, just the audio and PTT control for Heil mics and headsets.



AD-1 $25

For Yaesu FT-100 which multiplexes control, touch tone, audio all on one line making it impossible to use other microphones with this rig. This adaptor permits the FT-100 to use all Heil microphones and boomsets.

Important - To use a ProSet, you will need both an AD-100-8 and an AD-1 adaptor.

FS-1

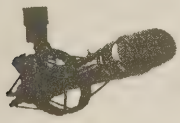
HS-1

HDAT

FS-1 PTT Foot Switch - metal body, 6' cable plugs into Heil cables. ***$30***

HS-1 PTT Hand Switch - Non-latching plugs directly into AD-1 or CC-1 interfaces. ***$25***

HDAT Headphone Attenuator for the FT-100 which does not have a headphone jack. Allows a 1/4" headphone plug to plug into the FT-100's 1/8" speaker jack. Has a 6 dB pad to reduce output to a safe level. ***$10*** *A must have.*



SM-1 Shock Mount

SB-1

LX-1

MA-1

Can be used on all booms or stands. Professional shock mount is a unique design. The mic clip is suspended from 8 points using a neoprene elastic cord assembly, suspending the microphone from the direct mount, thus isolating the low frequency acoustic coupling to your desk. ***$50***

Small Microphone Boom Its length is adjustable from 10" to 18" and accepts all standard 5/8"x27 microphone clips.

A unique adjustable elevation clamp using a tooth and cog assembly assures the SB-1 stays where you want it. It comes with a "C" clamp assembly that attaches the SB-1 to the edge of a desk, table or shelf. ***$33***

Balanced Studio Microphone Boom. Spring-loaded balanced professional studio microphone arm. This arm is balanced for microphones weighing two pounds. A handy "C" clamp type mount clamps onto virtually any surface. This balanced arm extends to 45" and accepts the standard 5/8"x27 thread of most professional microphone clips and the Heil microphone clips or SM-1 Shock Mount. ***$95***

Boom and Clamp Assembly for HM Series Microphone, is a telescoping articulated boom. It's equipped with a clamp for mounting to a shelf or table and extends to 32". Has three holes in the base for more permanent mounting applications. It rotates 360 degrees.

$45

Coaxial Cable Specifications

RG-8X Types				RG-213 Types		Solid Center		Flexible, Low Loss	
Type	RG-8X	RG-8X+	Super RG-8X	RG-213	RG-213+	SuperCable	Super 400	ExtraFlex	BuryFlex
Z	50Ω	50Ω	50Ω	50Ω	50Ω	50Ω	50Ω	50Ω	50Ω
VF	78%	78%		66%	66%	84%	84%	84%	84%
Dielectric	fp	fp	p	p	p	p/air	fp	p/air	fp
Center	#16 sc	#16 sc	#16 tsc	#13 sc	#13 sc	#9.5 c	.109 scca	#9 sc	#9 sc
Shield	c	c	tc	c	c	tc/al	tc/al	tc/al	c
Shield 1	95%	95%	98%	95%	96%	95%	91%	95%	91%
Shield 2						100%	100%	100%	
Jacket	I	IIA	IIA	IIA	IIA	I	PE	IIA	PE
O.D.	.242"	.242"	.242"	.405"	.405"	.405"	.405"	.405"	.406
Attenuation per 100 feet of coax									
10 MHz	1.1	1.1	1.1	.55	.55				
50 MHz	2.5	2.5	2.5	1.3	1.3	.64	0.90		
144 MHz	3.7	3.7	3.7	1.9	1.9	1.3	1.5	1.35 †	1.6
200 MHz	5.4	5.4	5.4	2.7	2.7	1.6	1.85	1.7 †	1.9
400 MHz	8.0	8.0	8.0	4.1	4.1	2.5	2.80	2.5 †	2.9
900 MHz							4.0	4.2 †	

The values in this chart represent manufacturer's data..

Conductor: al = aluminum c = copper tc = tinned copper sc = stranded copper wire scca = solid copper clad aluminum
Dielectric: p = polyethylene fp = foam polyethylene
Jacket: I = PVC Polyvinyl chloride IIA = Non-contaminating PVC = PE Polyethylene

Velocity Factor of Propagation Through Coaxial Cable

The velocity factor is the speed at which an RF signal travels through a material compared to the speed the same signal travels through a vacuum. The velocity of propagation is inversely proportional to the dielectric constant. Lowering the constant increases the velocity. Generally, the higher the velocity factor, the lower the loss through a coaxial cable.

Dielectric Material	Air	9913 types	Foam Polyethylene	Foam FEP Teflon	TFE Teflon	Polyethylene	Silicon	PVC
Vp in %	100	84	78-80	80	71	66 - 67	58	45

General Rules for Coaxial Cable

D = diameter of insulation under the shield
d = diameter of inner conductor.

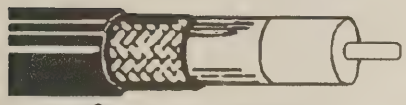
Velocity Factor, Velocity of Propagation, V_p
The higher the velocity, the lower the loss through a length of coax.
Raising the D/d has no effect on V_p
Raising the dielectric constant lowers V_p

Capacitance
Raising the D/d ratio lowers capacitance
Raising the dielectric constant raises capacitance

Impedance
Raising the D/d radio raises impedance
Raising the dielectric constant lowers impedance

Attenuation or Loss
Raising the D/d ratio lowers attenuation
Raising the dielectric constant raises attenuation

LOW LOSS COAXIAL CABLE



Super 400

50¢ per ft in 50' increments

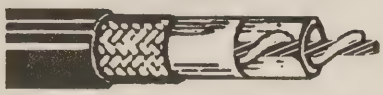
500' Spool $225

Due to its special nature, this cable, it is available only in 50' increments.

This is a copy of LMR 400 made by one of our most reliable coax manufacturers. Some report that it is better than the real thing. As you can see from its specifications, its loss is similar to our 9096IIA which is one of the best, low loss coaxial cables of the 9913 type available. It features a solid copper-clad aluminum center conductor and a tough foamed polyethylene dielectric. It's a perfect semi-solid dielectric alternative to ExtraFlex.

RECOMMENDATIONS:
All HF, VHF and UHF installations.

CONNECTORS:
PL-259- Standard types
N - Use special type, in stock



ExtraFlex 9096IIA

10 - 99' 65¢

100' - 499' 59¢

500' Spool $270
Odd Lengths * 55¢

This is International 9096-IIA. This is a top-of-the-line, flexible 9913-type coax. Construction is excellent with a 19-strand center conductor. It bends as easily as conventional RG-8 or RG-213. Will handle the legal power limit even at UHF.

RECOMMENDATIONS:
All VHF and UHF installations. HF runs over 200' feet. A must for crank-up towers and rotatable antennas in systems where low loss cables are needed.

CONNECTORS:
PL-259 - Standard types
N -Use special 9913 type

Bury Flex^{tm}

59¢ per ft in 50' increments

500' Spool $260

Due to its special nature, this cable, it is available only in 50' increments.

Bury Flex^{tm} is a low cost alternative to LMR and other hard line. It's highly flexible for rotator loops and applications requiring non-rigid coaxial cable. The jacket is Polyethylene and not PVC, so this is a true directly buriable cable. A slightly enlarged center conductor (vs. 9913) and the high tech foam PE dielectric work together to insure low signal loss. Since this cable is foam-filled, it is not nearly as fragile as similar, low-loss coax.

RECOMMENDATIONS:
All ExtraFlex 9096IIA applications.

CONNECTORS:
PL-259 - Standard types
N -Use special 9913 type

Jim's note: Due to extra large center conductor, installation of connectors will be easier if a few strands of the centers are trimmed.

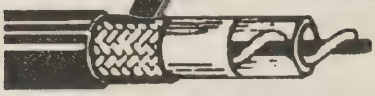
Explanation of various price schedules-

Spool Length - If you can use a whole spool of coax, we'll give you a discount. Generally all RG-8X size cables come in 1000 foot spools and larger coax is put-up in 500 foot spools. Rotator cable = 1000'

0-99' - Our new policy is to discontinue the 50 foot increment requirement with some exceptions. Now all wire and cable are sold with price breaks based on length.

100' up to Spool Length - any length in this range is the same price. Order the length you need.

Top Quality Coax



SuperCable

10 - 99'	56¢
100' - 499'	51¢
500' Spool	$235

SuperCable is International's type 9086. It is a very low loss, double shielded, high quality coaxial cable. 9086 is similar to Belden 9913 but has better braid coverage.

RECOMMENDATIONS:
Use for 2 meters and up unless cable runs are short where RG-213 is suitable. Use in high performance HF installations when cable runs are over 200'.

CONNECTORS:
PL-259 - Standard types
N - Use special 9913 type

RG-213

10 - 99'	39¢
100' - 499'	35¢
500' Spool	$157

RG-213 is the standard 50 coax replacing RG-8 which was the popular choice for years. RG-213 is similar to RG-8 but is built to a much higher standard.

RECOMMENDATIONS:
All HF installations and short runs on VHF and UHF. Use RG-8X for wire antenna installations due to the size and heavy weight of this cable. Good for HF runs out to 200'.

CONNECTORS:
PL-259 - Standard types
N - Standard types

RG-213 Plus

10 - 99'	45¢
100' - 499'	38¢
500' Spool	$184

There are always ways to improve a product and that is what was done to RG-213 Plus. It features an improved braid and even better quality, non-contaminating jacket.

RECOMMENDATIONS:
All RG-213 recommendations apply.

This is my personal choice for use in my new station!

CONNECTORS:
PL-259 - Standard types
N - Standard types

RG-8X

10 - 99'	19¢
100' - 999'	15¢
1000' Spool	$140

Premium Quality RG-8X is a low loss, low cost, 50 ohm coax that **WILL** handle the legal power limit. Losses on HF are only slightly higher than RG-213. **LOW** cost, **LOW** weight, and **LOW** loss make RG-8X a very ***best buy!***

RECOMMENDATIONS:
Use for all HF wire antennas. It is suitable for any HF installation including beams. Use on VHF only for short runs of less than 50 or 75 feet. Makes excellent jumpers and is perfect for mobile installations.

CONNECTORS:
PL-259 - Std types + UG-176
BNC - Special crimp type

Available in White

RG-8X Plus

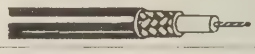
10 - 99'	26¢
100' - 999'	22¢
1000' Spool	$189

Most RG-8X is made with a type IA jacket. RG-8X Plus uses a Military type IIA, non-contaminating jacket which is preferred by many users. Except for jacket, the specs on this coax are identical to our Premium RG-8X.

RECOMMENDATIONS:
Applications are exactly the same as for RG-8X.

RG-8X+ is my favorite for wire antennas and wiring up the shack.

CONNECTORS:
PL-259 - Std types + UG-176
BNC - Special crimp type



Super RG-8X

10 - 99'	32¢
100' - 999'	28¢
1000' Spool	$245

This is a ruggedized version of RG-8X. It features a tinned-copper braid and center conductor, a new solid dielectric and type IIA jacket. It has high temperature stability and is crush resistance. ***Top of the Line!.***

RECOMMENDATIONS:
All RG-8X applications. This coax is ideal for mobile and marine installations. Use in permanent installations which require a physically tough coax.

CONNECTORS:
PL-259 - Std types + UG-176
BNC - Special crimp type

Antenna Wire, Ground Strap, Ladder Line, Rotator Cable

#14 Stranded (7x22) Hard-drawn 8¢/ft

This is the standard antenna wire. Stranding is very tight, well beyond industry standards. It is flexible, has long service life, and is easy to use. For all wire antennas up to 150' between supports.

#14 Stranded (7x22) Copper-Clad 10¢/ft

Stronger than #14 hard-drawn. A bit harder to work with. Use when heavy weather is a factor. See VariFlex #14 below.

SPECIAL ANTENNA WIRES

#13 VariFlex Insulated (19 strand) 17¢/ft

#13 copper-clad steel. Extremely tough jacket over a very flexible wire. Combination is about as stiff as hard-drawn 7-strand wire. Use whenever a very strong insulated wire is desired, in trees, for example. This wire is resistant to acid rain and corrosive contaminants in the air. Copper-clad steel wire.

#26 VariFlex Insulated (19 strand) CW 13¢/ft

Insulated with a thin, tough, black, polyethylene jacket.

This wire is made specifically for hidden antennas. It is extremely strong for its very small size. Use sky colored buttons for insulators, and an antenna made of this wire is nearly impossible to see in the air.

#18 Solid Copper-Clad Steel 4¢/ft

Ideal for ground radial systems, hidden antennas, loops, experiments.

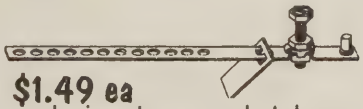
GROUND BRAID

For ground systems. Much more effective than any heavy gauge wire. Tinned for long life. This 'tinned' copper braid will last far longer than the bare copper shield stripped from an old piece of coax.

½" Tinned Copper Braid 65¢/ft
1" Tinned Copper Braid $1.19/ft

2" Solid Copper Strap .020" thick $1.75/ft

.020" x 2" Soft Copper strap is easily bendable. Strap ground rods together. Solder ground wires from each piece of equipment directly to this low inductance strap. Makes a low impedance ground. Most ground strap is only .010" thick or less. This is twice as heavy.



Ground Strap $1.49 ea

For connecting ground wires to ground stakes.

Flex-Weave™ is a revolutionary hybrid antenna wire. It is strong, doesn't kink or rust, and it is available in bare and insulated versions. It is amazingly flexible.

This virtually kink-free wire can be tied into a knot (just like rope) at the insulators.. This size is excellent for quads, wire beams, dipoles, and long wires.

#14 168-strand, bare 15¢ per foot
#12 159-strand, bare 18¢ per foot

100% copper rope type construction for strength, ultra-flexibility, and easy handling.

#14 168-strand PVC Insulated. 20¢/ft
#12 259-strand PVC Insulated. 27¢/ft

Jacket is a high grade polymer PVC. Colors available are black and Army green.

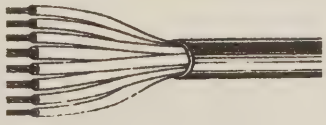
#14 168-strand PE Insulated. 17¢/ft
#12 259-strand PE Insulated. 22¢/ft

Jacket is a tough quality .015" slick *black polyethylene*. It's very tough. Perfect for heavy weather.

Ladder Line

This new, stranded, heavy-duty, poly-coated, window-type, Ladder-Line has become the new standard, replacing the old type made with #1 8 solid wire. Power rating far exceeds the legal limit.

#16 stranded, copper-clad conductors, actual impedance is aprox. 420-ohms		#14 stranded, copper-clad conductors, actual impedance is aprox. 390-ohms	
10-99'	22¢	10-99'	30¢
1' - 999'	16¢	100' -999'	26¢
1000' Spool	$145	1000' Spool	$240



We have premium SHIELDED rotator cables in two different sizes. *Special order cable is available to meet the special needs of big rotators.*

Rotator Disconnect

$8.95

Makes rotator installations easy. Pre-wire the rotator with a plug and jack assembly. No need to try to wire your rotator while on your tower. We use simple 8 pin trailer-type plug and jacks that splice into your rotator line.

R1 2 X #18, 6 x #24

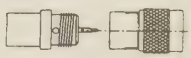
	Unshielded/Shielded
0 - 99'	26¢ /40¢ ft.
100 -999'	22¢/31¢ ft.
1000' spool	$200/$280

R2 2 X #16, 6 x #18

	Unshielded/Shielded
0 - 99'	47¢/50¢ ft.
100 -999'	37¢/44¢ ft.
1000' spool	$350/$400

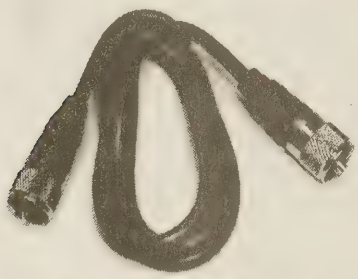
CUSTOM JUMPERS

Installing RF connectors is not difficult, but it takes a lot of practice and the correct tools to do it properly and make them look and work right. We have the special tools and install dozens of connectors every day. This custom service usually delays your order only two or three days.

Choose connector and coax type.	Connector Type	9086, 9096 9096F	RG-213 RG-213+	RG-58, 59 RG-8X CQ-8X IIA	Super RG-8X BuryFlex
	PL-259 Silver-Teflon	$6	$6	$6	$6
	PL-259 Gold-Teflon	$6.50	$6.50	$6.50	$6.50
	NEW N Silver-Teflon	$6.50	$6.50	$6.50	$6.50
	BNC	Not Available	Not Available	$6.50	$7 (Super RG-8X)

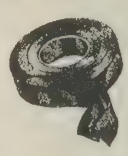
Jumper Price = Sum of cost of connectors installed + price of coax

The connector price is included in the installation charge



Our factory jumpers are gray in color. MFJ jumpers are black.

Don't forget CoaxSeal, tape and Cold Seal.



See page 67

Factory Made Jumpers

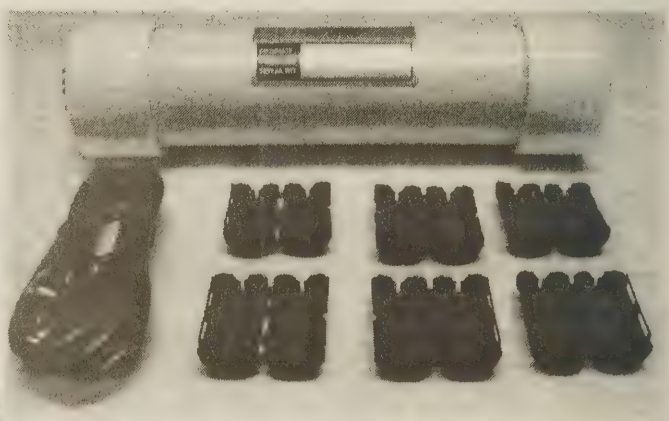
Coaxial Jumpers with Molded PL-259s

Bonus - I've got better pricing on our jumpers and you get the savings. We still carry the MFJ jumpers, too. Both types of RG-8X patch cords have similar, heavy-duty ***rubber boots*** which provide strain relief. Ours are gray in color. MFJ's are black. These are quality jumpers.

RADIO WORKS	MFJ
RG-8X 3 foot $4.95	$5.95
RG-8X 6 foot $5.95	$9.95
RG-8X 12 foot $7.95	not available
RG-8X 18 foot $9.95	$12.95

Take Care of RFI problems before they get started.

Order your RFI Kit Now!



NEW!

33 Foot Telescoping Fiberglass Mast

Collapses to 3.8' 3.3 pounds

Just pull out each section and twist to lock. It takes about 15 seconds. The bottom section is 1 3/4" in diameter. Great for portable and temporary use – RV, travel, hamfests, field day, DX'peditions. *They are perfect for use in emergency application, both land based and marine.*

It's perfect for all emergency and portable applications. It will support lightweight dipoles and loops.

Super strong fiberglass flexes to resist breaking. Black color resists UV effects. One year warranty.

I am currently working on several antennas which will use these masts. If you don't have any space or want to hide an antenna, this mast can do the job.

I use one of these masts on my RV. Combined with a LDG automatic tuner, I can put up a truly effective vertical in just minutes, once on site.

No guying is needed if supported from the base. However, you can make sure it is supported properly by using our Kevlar'™ support line.

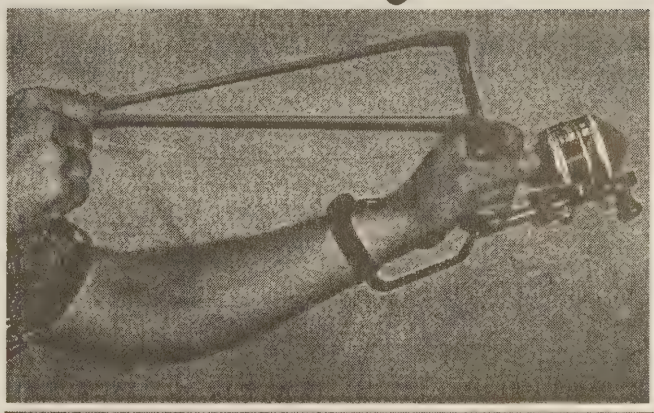
Note: At full height, the mast will support only a limited weight. If the antenna too heavy, simply don't use the topmost sections. The height will be reduced by a few feet, but your antenna will be in the air. And, it will be effective.

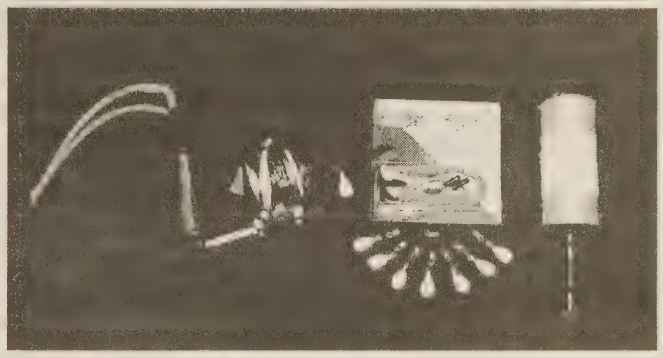
Here is a hint - Are you in a situation where a tall mast is not allowed? It only takes 15 seconds to pull out the sections and lock in place. When you're done, just drop your antenna. It only takes another 15 seconds. It can't get easier than this.

Stay tuned for future developments of special, all band, antennas from The RADIO WORKS.

Only $75

EZ-Hang





EZ-Hang Deluxe Kit Includes

EZ Hang
Spare Bands
EZ Winder
7 Weights & Clips

$98

EZ-Hang is a specially selected spinning reel combined with a hunting slingshot and the proper weights and line to make your next antenna installation a snap.

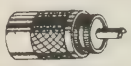
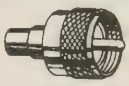
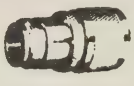
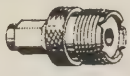
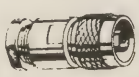
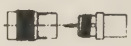
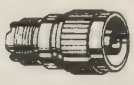
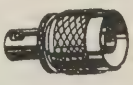
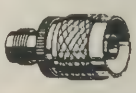
The slingshot has a tempered steel yoke, welded construction with easy release button and fixed arm support. It uses the highest quality tubular thrust bands and has a padded wrist support for extra comfort. The extra bright yellow weights make it easy to see in the trees.

The "Intermediate Line Dispenser" features 500-feet of #18 Nylon line with 155-pound break strength. The line color is an easy to see orange color.

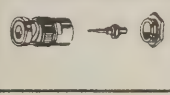
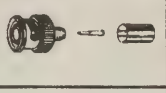
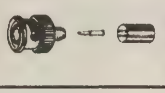
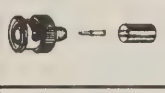
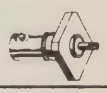
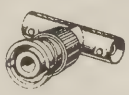
If you've read my suggestions for installing wire antennas, you've seen my three-line method. The EZ-Hang supports my recommended system. The first line is the light fishing line off the spinning reel. The "Intermediate Line Dispenser" is the second line and is pulled into the tree with the lightweight line from the slingshot. The final line is our Mil Spec line or our Double Dacron'™ antenna rope as the final support rope pulled up by the second line. This is the easy way to get your antenna into the air.

Extra weights are available at $7 for a pack of 5.
Intermediate Line Dispenser with 500' of orange colored line. $15.95

RF Connectors- Top Quality, Low Prices

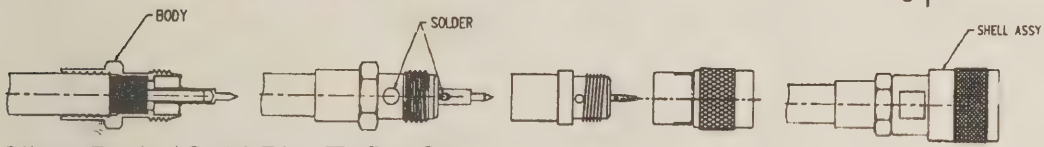
							
	PL-259 Silver/Teflon $1.29	PL-259 Gold/Teflon $1.59	For RG-59, RG8X UG-176 Nickel 25¢	For RG-59, RG8X UG-176S Silver 39¢	For RG-59, RG8X UG-176G Gold 49¢	For RG-58 UG-175 Nickel 25¢	For RG-58 UG-175S Silver 39¢
#405 M-359 UHF T $3.20	#406 UG-363 Bulkhead $2.89	#407 SO-239 4 HOLE 99¢	#407S 4 Hole Silver, Teflon $1.89	#408 PL-258 95¢	#409 SO-239SH SH Chassis $1.09	#410 UHF DM $1.69	#303 UG-273 UHF/BNC $1.79
							
	#904 UHF/RCA $1.19	#611 UG-83 UHF/N $2.79	#925 UHF/TNC $2.89	#876 N (F) to UHF (F) $4.00		#1575 SMA/UHF $4.75	#1578 SMA/BNC $3.95
							
#601 UG-21 Nickel $2.75	#601S UG-21 Silver/Teflon $3.75	#663 UG-21 Nickel for 9913 $3.25	#663S UG-21 Silver for 9913 $4.25	NEW N Silver Teflon RG-213, 9913- $3.00	#606 Crimp RG-8 $2.59	#665 Crimp 9913 $2.99	#665S Silver 9913 $3.99
							
#603 UG-58 4 hole $1.89	#604 UG-57 N DM $3.60	#605 UG-29 N DF $2.69	#609 UG-146 N/UHF $3.79	#610 UG-27 N 'L' $2.89	#613 UG-201 N/BNC $2.90	#614 UG-107 N 'T' $3.50	#721 N/TNC $3.29

Now, even higher quality at great prices! RF Connectors

							
#381 for RG-58 $1.99	#382 for RG-59 $1.99	#385 for RG-8X $1.99	#311 for RG-59 $1.49	#312 for RG-58 $1.49	#313 for RG-8X $1.59	#308 UG-290 4 hole $1.49	#304 UG-1094 single hole $1.39
							
#305 UG-914 BNC DF $1.29	#307 UG-306 BNC 'L' $2.50	#309 UG-247 BNC 'T' $2.19	#319 BNC 3F $2.79	#310 UG-491 BNC DM $1.95	#306 UG-255 BNC/UHF $1.79		#903A BNC/RCA $1.39
#612 UG-349 BNC/N $3.29	#421 RCA/UHF $1.79	#901 RCA/BNC $1.39	#723 TNC/UHF $2.29	#714 TNC/BNC $2.49	#424 PL-259 Crimp RG-213 $1.79	#425 PL-259 Crimp RG-8X $1.59	Other Crimp connectors are available. 'N' for 9913 'N' for RG-213 BNC for RG-58, RG-59 & RG-8X

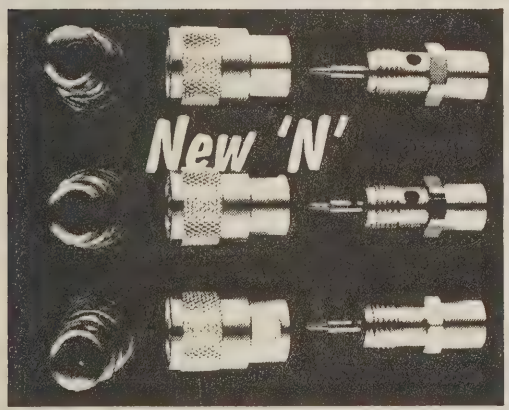
New Connectors

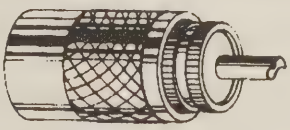
New type 'N' Connector



Silver Body, Gold Pin, Teflon® insulation. Rated to 2.5 GHz
Assembles as easily as a PL-259. Solder both braid and pin.

New 'N'
$3.00 each
$27.50 pk of 10





PL-259 made in U.S.A.

	Each	Pack of 25
Silver & Teflon®	**$1.29**	**$27**
Gold & Teflon®	**$1.59**	**$34**

Antenna Support Line

Synthetic Rope Characteristics

Man-made fiber ropes are stronger and more durable than those made of natural fibers. Most chemicals, rot, or mildew do not affect synthetic rope. Most synthetic rope may be stored wet or dry.

NYLON

Nylon is highly elastic and can absorb sudden shock loads that would break ropes of other fibers. It has very good resistance to abrasion, rot, oils, gasoline, grease, marine growth and most chemicals. Nylon deteriorates more rapidly than Polyester when subjected to direct sunlight. Due to the characteristic stretch of nylon, wire antenna installations will require occasional retensioning of the support ropes.

POLYESTER (i.e., Dacron®)

Dacron® Polyester is not quite as strong as nylon, but has far better resistance to ultraviolet degradation from sunlight. It is not as elastic as nylon and therefore does not stretch as much as nylon. These characteristics are a plus in an antenna support rope. Other than these two distinctions, the nylon and polyester characteristics are practically the same.

POLYPROPYLENE

This is a strong, lightweight rope. It is waterproof, and resistant to rot, oils, gasoline and most chemicals. Polypropylene is subject to rapid deterioration when exposed to direct sunlight, so its life is very short when used as an antenna support rope.

POLYETHYLENE

Polyethylene is similar to Polypropylene, but is slightly heavier. It is not as strong. It, too, deteriorates quickly in direct sunlight.

Compared with Nylon, Dacron polyester is a far more useful and desirable antenna support line.

KEVLAR®

By weight, Kevlar® is stronger than steel. This is the material used in 'bulletproof vests.' The molecular structure is such that it does not stretch and this characteristic makes it perfect for many antenna applications (boom and element support in beams, and general antenna use). Without a protective jacket, it deteriorates rapidly in sunlight. To counter this problem, Kevlar rope, meant for out-of-doors use, has a protective outer jacket made of Dacron® Polyester. The combination results in an incredibly strong, stretchless, long life rope.

KEVLAR®
The Vertical Antenna Support Line

Our Kevlar line is perfect for guying vertical antennas. It is strong (500 pound test), is made to endure severe weather and the devastating UV effects of the sun. Most importantly, Kevlar line DOES NOT STRETCH. You don't have to keep readjusting the length of the guys.

We recommend guying all verticals. One set of guys will drastically increase the survivability of the antenna in heavy weather. If the vertical antenna is over 25 feet tall, you might want to consider using two or more sets of guys. Follow the antenna's instructions for guying. If instructions are not included, you can just tie our Kevlar line to any appropriate point on the antenna. Kevlar line is non-conductive.

Not for towers

KEVLAR®
The Boom Support Line

Kevlar line is also perfect for supporting beam antenna booms or elements. The high strength, low wind resistance and non-stretch characteristics are just what you need for beam element or boom support.

Antenna Support Rope

We carry several antenna support rope types. Our Mil Spec Dacron® rope is by far the most popular. It is excellent for nearly every antenna installation purpose. Our .075", 500 pound test Kevlar® comes in second in popularity. Our Kevlar line is perfect for use as a boom or element support line in beams. Its small size adds little to the wind resistance of the beam antenna. Use Kevlar to 'guy' a vertical antenna. It increases the wind-survival rating by a large percentage. Kevlar is also popular as a wire antenna support rope.

Our best Dacron antenna support rope is our Double-Braided type. It has the longest life of all our premium antenna support lines.

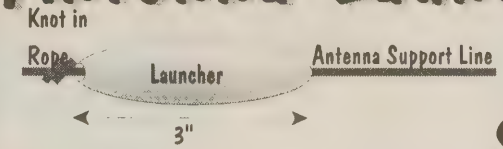
Mil Spec Dacron®

We now have this very popular rope manufactured exclusively for the RADIO WORKS. It's even better than the original because we are getting the same rope the military is buying, not the mill-ends or seconds.

Kevlar®

This Kevlar rope is available exclusively from us. Because it does not stretch, it is perfect for 'guying' vertical antennas and beams elements and booms. The Dacron® outer jacket gives long, reliable life. Available only in 200-foot spools. Do not use to support wire antennas unless tension release device is used (i.e. springs, etc.)

Antenna Launcher



The "Lead Launcher" $3

Here is an easy way to get your antenna support line over a tree branch or other support. It's heavy enough to pull your rope back to the ground, too! Just insert your antenna support line (up to 3/16") through the hole in the Launcher. Tie a knot in the support line and you're ready to throw. They weigh several ounces, but if you are a real "arm," you might want to slide two or three Launchers on the line. Our 3/16" Mil Spec and Double-braided Dacron® rope are a perfect fit.

Launchers are perfect for field day, portable and emergency operation as well as putting up wire antennas in your backyard.

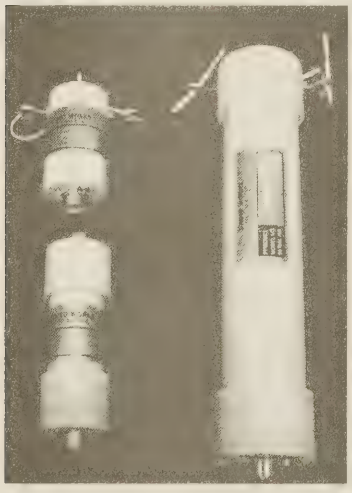
Specification	MilSpec Dacron®	Double Braided Dacron®	Double Braided Dacron®	Double Braided Dacron®	Kevlar® + Dacron®
Size	#5 (3/16")	3/32"	3/16"	5/16"	.075"
Static Test Weight	700 pounds	260 pounds	770 pounds	1700 pounds	500 pounds
Max working load	140 pounds	52 pounds	150 pounds	340 pounds	100 pounds
Color	Olive Drab	Black	Black	Black	Black
Abrasion resistance	Excellent	Excellent	Excellent	Excellent	Excellent
Initial stretch	Good	Good	Good	Good	None
Insulation properties	Very high	Very high	Very high	Very high	Very high
Maximum length	3000 feet *	3000 feet	500 feet	500 feet	200 feet **
Price, 100' hank	**$ 8**	**$6**	**$12**	**$17**	
Price, 200' hank	**$16**	**$12**	**$24**	**$34**	
Spool Price	**$195 (3000')**	**$150 (3000')**	**$54 (500')**	**$78 (500')**	**$16.95 (200')**

* 3000 foot spools of Mil Spec Dacron may not be continuous. Full spools may have one or two splices.
** Available only in 200 foot spools

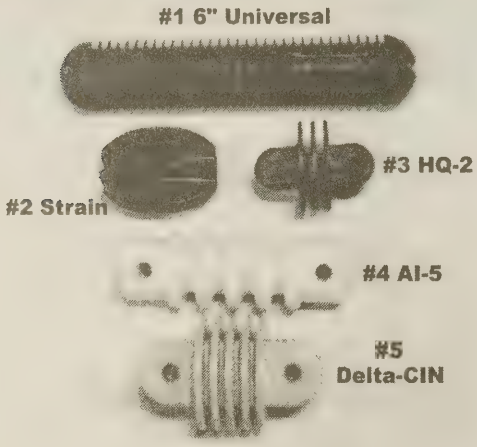
Insulators

Alpha Delta

Quality center insulator features a built-in, replaceable SEP ARC-PLUG static electricity protector. Bleeds off slow rising static electricity charges and sends it to ground before it can damage your gear. The center insulator and end-insulators are made of rugged, UV resistant DELTALLOY. Hand soldered components and stainless steel hardware. **For best results, use a T-4 Line Isolator with this unit. Delta-C Hardware Kit - Center Insulator, plus 2 end-insulators** $29.95/set



The ***most important center insulator*** in any antenna, i.e. dipole, sloper, etc., is a ***quality Current balun***. We build the best current baluns and each has the needed stainless steel wire strain relief eye-bolts and center support eye-bolt. No other center-insulator is needed.



End-Insulators

#1 - 6" Universal $3

Works as a strain insulator or conventional end-insulators. Ribs are spiral cut for winding loading coils, etc. Black plastic.

#2 - Plastic Strain 50¢

These inexpensive plastic strain insulator are great for any light-duty project. They are not suitable for tower, but are OK for masts, verticals, etc. We use them on wire antennas because you can install them in the middle of a wire without removing the end-insulator.

#3 - HQ-2 85¢

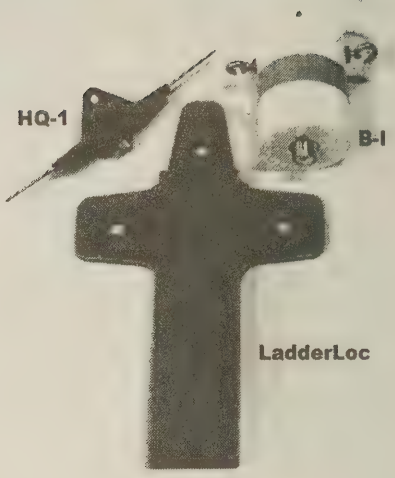
The HQ-2 end-insualtor is made by the same manufacturer as the HQ-1 center-insulator. These are only about 1 ½" long. Yet, with its deep ribs, the leakage path is nearly 6". They are glass-filled and nearly impossible to break.

#4 - B&W AI-5 $4.50

4-inches long and rated at 1000 pounds for big antennas. This glass-filled plastic end-insulator is the right choice for heavy-duty installations.

#5 - Delta CIN $1.50

Rugged, UV resistant DELTALLOY. Long leakage path. This is the insulator we use in most of our antennas. Enough said.



Center-Insulators

HQ-1 $7.50

These are the center-insulators we use in our antenna systems. They are light weight but incredibly tough glass-filled ABS plastic. A built-in drip-lip over the SO-239 connector helps weatherproof the connector. They are perfect for any type wire antenna that does not require a balun at the feedpoint.

B-I $10

Top quality conventional center insulator made just like our baluns. #14 insulated wire are brought directly outside the case for soldering to your antenna to avoid any chance of failure so prevalent with screw and nut compression connectors. Stainless steel hardware. You can't build a more reliable center insulator.

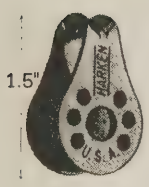
Ladder-Loc $12.95

If you use ladder line, this is the correct center insulator for your project. It properly supports and strain relieves ladder line for the longest possible life. Full instructions are included. 9" x 6"

Stainless Steel Pulleys

for antenna support rope

You asked for them.
Now we have them –
The correct pulleys for antenna support line.



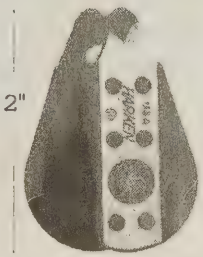
#224

$11.95

New

#292

$15.95



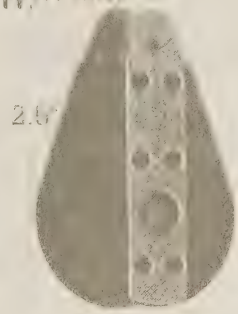
#082

$13.95

New

#166

$17.95



#125

$15.95

Micro Block

Sheave diameter = .875"
Line size = 3/16" & 1/4"
Breaking strength = 1200 #
Shackle pin dia = 3/16"
Length = 1.5"
Max Working Load = 200 #
Ball bearings
Tough Delrin sheave is UV stabilized for years of trouble-free service.

Bullet Block

Sheave diameter = 1.125"
Max line size = 5/16"
Breaking strength = 2000 #
Shackle pin dia = 3/16"
Length = 2"
Max Working Load = 300 #
Teflon impregnated, Hardkote anodized aluminum sheave.
Roller bearings

Big Bullet Block

Sheave diameter = 1.5"
Line size = 5/16" & 3/8"
Breaking strength = 2000 #
Length = 2.5""
Max Working Load = 300 #
Large diameter sheave with low turning friction
Tough Delrin sheave is UV stabilized for years of trouble-free service.

I have suggested using high quality "Sailboat" pulleys in several of my publications. This type pulley is precision made so that there is little space between the sheave and sides of the pulley. Unlike hardware store pulleys, it's impossible for the rope to jam by rolling off the sheave.

Since pulleys of this type are almost impossible to find in most areas of the country, I have selected five different models which are well suited for use with the high quality antenna support rope that we sell. They are manufactured by one of the preeminent makers of sailboat rigging.

New for this issue are the "swivel" pulleys. I now use these because if your support rope twists, the antenna isn't twisted. It's a must for loops.

General Features

Ball bearings carry both the line load and prevent sheave from rubbing on the cheeks of the block.

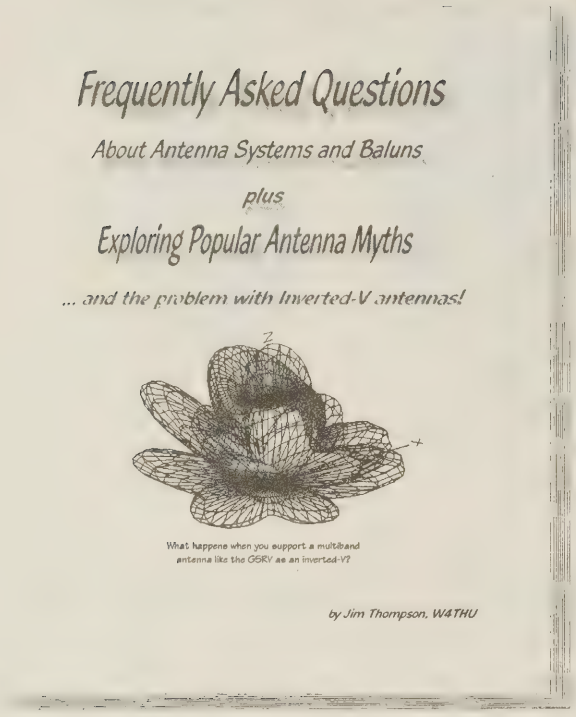
Roller bearings permit maximum loads in a small pulley.

All pulleys have stainless side plates to properly distribute loads.

Delrin™ and aluminum sheaves provide the strength, endurance

Important - These pulleys are designed to protect soft support ropes. These are not the correct pulleys for use with wire or Kevlar.

Jim's Book


Frequently Asked Questions
About Antenna Systems and Baluns
plus
Exploring Popular Antenna Myths
... and the problem with Inverted-V antennas!
What happens when you support a multiband antenna like the G5RV as an inverted-V?
by Jim Thompson, W4THU

Here is a copy of the back cover with its brief outline of the book's contents. As you can see, this is not your ordinary antenna book.

This book answers questions and dispels myths. The material is presented in a style that's easy to read and Jim, W4THU, is not beyond poking fun at jealously held concepts that don't quite hold up under close scrutiny. However, at the heart of this book are questions that a lot of hams ask over and

The Myths

"If it didn't fall down last winter, it wasn't big enough!"
"Coax is coax. So what if it's 15 years old."
"Verticals radiate poorly in all directions."
"Vertical antennas are expensive."
"You can't be a DX'er with a dipole."
"Wire antennas are for the low bands only."
"An 80 m antenna works better at 55 feet than at 40 feet."
"Wire antennas don't need baluns."
"A low SWR means that your antenna is working well."
"If an antenna doesn't fit, bend it up until it does."

The Questions

Do resonant antennas really outperform nonresonant antennas?
The SuperLoop verses the CAROLINA WINDOM. Which is better?
What antenna outperforms a Double Bazooka?
How does the CAROLINA WINDOM compare
To an open-wire fed dipole?
End-fed antennas - RF looking for trouble. Is that true?
What is the minimum Inverted-V angle?
Is the multiband Inverted-V antenna a No-No?
A dipole with gain. Is this possible?
What is the effect of letting your antenna droop in the middle?
Does the CAROLINA WINDOM really work? How?
How does antenna height affect antenna performance?
What is the difference between a Voltage-balun and a Current-balun?
Do 9:1 baluns and 450-ohm ladder-line really mix?
Do loop antennas really need baluns?
What makes a balun heat up?
..... and that's just the beginning. There is much, much more.

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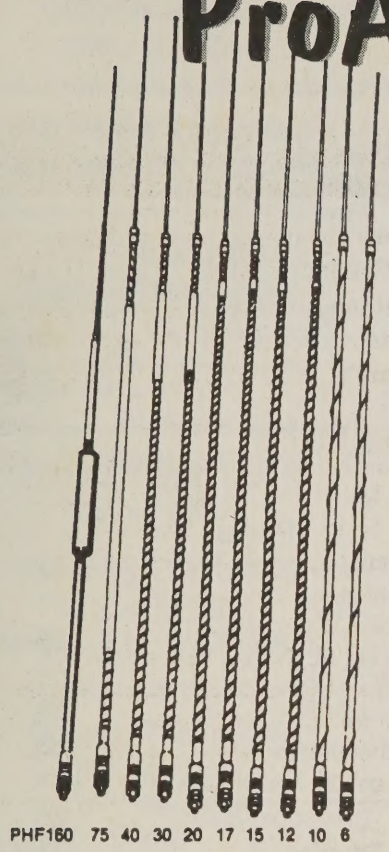
ProAM HF Mobile



Mobile Whips	
PHF75	$22.95
PHF40	$18.95
PHF30	$18.95
PHF20	$18.95
PHF17	$18.95
PHF15	$18.95
PHF12	$18.95
PHF10	$18.95
PHF6	$18.95

160 m antenna is no longer available.

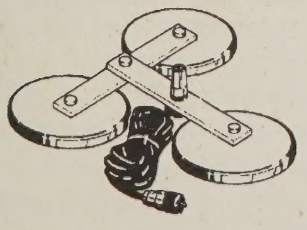
The Pro-AM H.F. mobile whips are heavy-duty, slim line antennas designed for high efficiency and reliability.

Heavy-gauge copper wire wound on 3/8" fiberglass, with nickel-chrome brass fittings and 17-7 taper ground stainless steel whips, assure dependable mobile operation. The 4-foot stainless steel whip is field tuneable for lowest VSWR and double locked with S. S. set-screws. The antenna features 3/8-24 ferrule to fit standard mobile mounts.

Power-rated at 250 watts P.E.P. for top mobile performance.

Overall antenna length is about eight (8) feet.

The PRO-AM mobile antenna line has received excellent reviews in Ham Radio publications. We have had very good results in mobile and MicroDipole[tm] applications for several years. I have no reservations recommending PRO-AM antennas. .....Jim



MM3401
Maxi-Magnet Kit

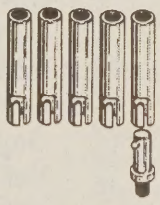
5-inch magnets, heavy-duty aluminum frame, 17' RG-58 with PL-259. **$47.95**

MicroDipole[tm]

To build your own MicroDipole[tm] antenna system, order two, identical whips and one DAK mount for each band. Also, order a B1-2K, B1-5K or Y1-5K and you'll receive the product manual which has full instructions for the MicroDipole[tm].

MFJ Mobile Whips

We will carry the MFJ HF mobile whips as well as the ProAm whips.

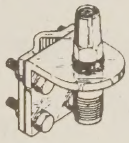


Model 103S $23.75

Set of one base and 5 twist-lock connectors. Use with 5 whips. Save money by not purchasing 4 bases you won't need.

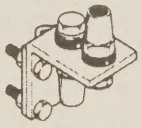
Mobile Mounts

The following are stainless steel 3-way mounts Mount horizontally, vertically, or flush. Heavy-duty 3/8-24 connector. Heavy gauge bright stainless steel bracket and back plate. All stainless steel hardware. Fits all standard 3/8-24 antennas.



SS100AD $9.95

SO-239 Coax connector.

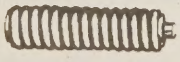


DAK $13.95

Accepts 2 antennas for vertical or horizontal dipoles. This is the mount used in the MicroDipole.

Model 103 $8.95

Quick disconnect - spring loaded for antenna removal. Chrome-plated brass, stainless steel spring and pin. For 3/8-24 antenna and mounts.



SS504 $10.95

Stainless steel spring. Inserts for 3/8-24 antennas.

#604 $23.75

Heavy-duty, large stainless steel spring with 3/8-24 stub. To be used with ball mount.

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We can ship via U.S. Postal Service (USPS). USPS or other special services. If extra handling is required, **a $5 'Special Handling Charge' will apply in place of the usual $3 handling charge.**

HANDLING CHARGES

The added cost of packaging materials (bags, boxes, tape, labels, weekly UPS charges, etc.) could be hidden in increased prices but to be fair to everyone, local, hamfest and mail order, we charge customers only for extra services used.

The handling charge is $3.

GUIDE TO SHIPPING COST

Antennas and wire are heavy items. Here is a guide to help estimate shipping charges. Consider the distance and weight when estimating shipping cost.

Minimum S&H is $8.

As a general guide, on orders approaching $100, add 10% S&H. Above $100, try 9%. If you are ordering heavy items, such as coaxial cable and large quantities of wire, allow for the extra weight. YOU WILL BE CREDITED FOR ANY OVERAGE.

PAYMENT

Visa and Master Charge, Money Orders, Bank Checks, and personal checks.

Allow 10 - 14 days for personal checks to clear. Allow travel time for your letter to reach us and the shipment to return.

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Products are not eligible for return if they have been used or in any way put into service. Antennas, once opened, are not returnable. PRODUCTS ARE NOT AVAILABLE FOR EVALUATION except to recognized writers or by request of a publication.

All returns are subject to a 15% restocking fee, are less shipping and must be received within 10 days of your receiving a RETURN AUTHORIZATION number. Returns will not be accepted unless AUTHORIZED. Refunds will be issued in the same form of payment as the original purchase. All returned products must be complete as shipped. **Products may not be returned without a copy of the original sales slip**

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